ENVIRONMENTAL ASSESSMENT BOARD

Ontario

ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 67

DATE: Tuesday, October 1, 1991

BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

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EA-90-01

ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act, R.S.O. 1980, c. 140, as amended, and Regulations thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro consisting of a program in respect of activities associated with meeting future electricity requirements in Ontario.

Held on the 5th Floor, 2200 Yonge Street, Toronto, Ontario, on Tuesday, the 1st day of October, 1991, commencing at 10:30 a.m.

VOLUME 67

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
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MS. G. PATTERSON	Member

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---Upon commencing at 10:33 a.m.

THE REGISTRAR: This hearing is now in session. Please be seated.

THE CHAIRMAN: This morning we start Panel 5 and I thought perhaps I should just confirm some of the dates which most of you already know.

On October the 10th, which is a week from Thursday, we will spend some time on the preliminary scoping of Panel 6, the Hydraulic Panel.

And Monday the 14th is Thanksgiving and Tuesday the 15th, there is a field trip, so there will be no hearing here on Tuesday the 15th.

On the 18th, which is a Friday, I just mention parenthetically that that is the extended date for statement of concerns on Panel 6, the Hydraulic Panel.

The Board is taking its mid-fall break on the week of the 21st - that is the 21st to the 24th inclusive. Our expectations based on what we have been able to gather from discussions is that this panel ought to be finished by the end of October, with the Hydraulic Panel starting on Monday, the 4th of November. To do that, I think we have to be all very conscious of time. Time is a non-renewable resource.

And so that I am going to now read out

what I understand is the agreed order of cross-examination.

I would like to say in advance that I think we are very grateful to the cooperation that everybody has shown in scheduling the examinations and there has been really a minimum amount of down time. But it is important that the order of cross-examination be maintained and that people keep track of what is going on so that we have as few gaps in the flow as possible.

IPPSO will be starting the cross-examination followed by MEA, followed by AMPCO, followed by the Gas Association, followed by Dofasco, followed by Northwatch, followed by the Coalition, CEG, then the City of Toronto, Energy Probe, Pollution Probe, NAPA, the North Shore Tribal Council, NAN, the Moose River/James Bay Coalition, OMAA, Mrs. Mackesy and the Government of Ontario.

Have I left anybody out or is there any comment on that order? That order, we understand, has been the order that was agreed by the parties.

Yes, sir?

MR. HUNTER: My name is David Hunter. I am counsel for Dofasco. I will be approaching the other parties to see if we might rearrange our place on

that list. I have a conflict at the latter part of next week and the beginning of the next week. I will inform the Board.

THE CHAIRMAN: All right. I think, as a matter of fact, I have a note of that, Mr. Hunter, and if you can just coordinate with Ms. Morrison on that.

MR. HUNTER: Thank you.

THE CHAIRMAN: Mr. Thompson?

MR. THOMPSON: I will talk with Mrs. Morrison to arrange something suitable.

THE CHAIRMAN: All right. Thank you.

Anyone else?

Mr. Campbell?

MR. B. CAMPBELL: Thank you, Mr. Chairman. Appearing with me in Panel 5 is Ms. Gail Karish. That is spelled K-A-R-I-S-H.

The Panel 5 witnesses, starting closest to the Board, are Mr. Ken Snelson who has appeared before you already in these proceedings and I have reminded him that he remains under oath in these proceedings. He is Manager, Demand/Supply Integration, System Planning Division of Ontario Hydro.

Next and in the centre of the panel is Mr. Paul Vyrostko. That is spelled V-Y-R-O-S-T-K-O. Mr. Vyrostko is Director of the Non-Utility Generation

Division. And farthest from the panel is Mr. Keith Brown. He is Superintendent, Programs and Special Studies, also in the Non-Utility Generation Division.

And if I could ask Mr. Brown and Mr. Vyrostko to be sworn in, please.

KEITH DOUGLAS BROWN,
PAUL FRANK VYROSTKO; Sworn.
JOHN KENNETH SNELSON; Recalled.

THE REGISTRAR: Mr. Snelson, you are still under oath. Thank you.

MR. B. CAMPBELL: Mr. Chairman, I am going to suggest that the next exhibit number be given to the supplementary witness statement that was distributed, according to the Board's request, on September 20th, 1991.

THE REGISTRAR: The next exhibit number, Mr. Chairman, is 319.

---EXHIBIT NO. 319: Supplementary witness statement distributed, according to the Board's request, on September 20th, 1991.

MR. B. CAMPBELL: So that would be Exhibit 319. I have also distributed, as is our practice, a package of overheads that will be referred to by the panel in their direct testimony, and if that package could be given the next exhibit number, that is 320.

Would that be satisfactory?

THE CHAIRMAN: Yes.

---EXHIBIT NO. 320: Package of overheads

THE CHAIRMAN: Perhaps we might give the interrogatory number now, too, and the undertaking number and that will be easier.

THE REGISTRAR: That will be 261.79.

THE CHAIRMAN: No, no. We have got a new panel.

THE REGISTRAR: Oh, a new one, I beg your pardon. So it is.

MR. B. CAMPBELL: So we would reserve then an exhibit for interrogatory listing and that exhibit number would be 321, Mr. Thompson?

THE CHAIRMAN: 321 for interrogatories.

MR. B. CAMPBELL: I, of course, am reluctant to ...

THE CHAIRMAN: I understand that, Mr. Campbell, but still in anticipation, we can put 322 down for undertakings.

MR. B. CAMPBELL: All right.

I can see if I hope to win that battle I am going to have to eventually drum up a little more support than I presently have been able to, but I will have to save it for another day.

Mr. Chairman, members of the panel, we

will certainly complete the direct testimony of this panel today, I expect with some time to spare. The direct testimony I guess can easily be described as being in six sort of broad areas.

There will first be a section dealing with some of the terminology and addressing some of the issues associated with Hydro's promotion of non-utility generation, identifying advantages and disadvantages and so on in an overview sort of way.

Secondly then, Mr. Snelson will speak briefly to the place the non-utility generation option plays in the broader context of the Demand/Supply Plan.

In the third area, Mr. Brown and Mr. Vyrostko will provide some specific details on Hydro's non-utility generation activities.

Fourth, Mr. Snelson will address system integration issues.

Fifth, Mr. Brown will deal with the forecasting of non-utility generation potential and what are his expectations as to what can be attained over the planning period.

And then finally, there will be just one final area with Mr. Vyrostko dealing with how Hydro intends to work with the industry to promote non-utility generation.

DIRECT EXAMINATION BY MR. B. CAMPBELL:

Q. Now, against that background, Mr. Vyrostko, I believe, my first question is for you. In paragraph 4 of the supplementary witness statement that is filed, it includes by noting that Ontario Hydro is committed to obtaining the maximum economic non-utility generation.

[10:43 a.m.]

I would like you to go through that terminology and series of words and just explain what is meant by the various phrases involved, and I would ask you to start, please, simply by explaining what non-utility generation is.

MR. VYROSTKO: A. Thank you, Mr. Campbell.

"Non-utility generation" from Ontario Hydro's perspective is defined as electrical generation in the Province of Ontario that is neither owned nor operated by Ontario Hydro but is connected to the bulk electricity system or the distribution electricity system. It is not defined as electricity generated outside the province and sold to a point inside the province.

There are many terms that are used simultaneously for non-utility generation, terms such

as "independent power", "private power", "parallel generation" or "independent generation".

With respect to the term "economic", based on Hydro's strategy that says we will pay up to avoided cost, the purchase of electricity is then set such that if we pay no more than the avoided cost, then the customers of Ontario Hydro would in fact not see private generation being any more expensive than the choice that Ontario Hydro were to put in if they were building the facility themselves, and therefore, as long as we pay avoided cost or less then from our perspective non-utility generation is economic.

Finally, the term "maximum". Ontario Hydro encourages all projects that are economic and preferred and can be integrated into the hydroelectrical system. We don't have any ceiling on the number of NUGs that we can get within that concept, and so if therefore that is the term referred to as "maximum".

Q. All right. Now we are going to come back to some discussion of what that term "preferred" means within the concept of maximum later in these proceedings, but I would just note, I take it, Mr. Vyrostko, that that is an important element to bear in mind in that use of the word "maximum" economic?

A. That's correct.

Q. Well, we will come back to that, but I would like you to briefly outline, please, the various types of non-utility generation that you are involved with.

A. In essence the non-utility generation is broken down into two types, and they are categorized by fuel - that is, the primary energy that is used to develop non-utility generation - and then the second one is the process.

And if I could draw your attention to the slide, which is page 1 of the exhibit.

Q. Exhibit 320?

A. Exhibit 320. Across the top we have the category of primary energies, and the typical energies are falling water, natural gas, and the third one is energy from waste which could include wood waste, municipal solid waste or landfill gas.

On the lefthand side of the transparency there are the different conversion processes that are used to convert the primary energy into electricity. For instance, the hydraulic process is taking falling water through a turbine and producing electricity.

Cogeneration is the simultaneous production of both electricity and thermal energy or

heat or steam from a single fuel, typically natural gas but it could also be from wood waste, and so that would be one of the other process.

And then the final one is the other thermal process, which typically represents the utility facility whereby you take a fuel, whether it be natural gas or energy from waste, and put it through boilers to create steam which drives a turbine and produces electricity.

Based on Exhibit 74, which is the Demand/Supply Planning Strategy, Ontario Hydro has preference for non-utility generation that is generated using renewable energies or high efficiency cogeneration processes, and if we look on the transparency you will see that all of those that I have talked about, except for one, falls within the category called the "preferred" type of non-utility generation.

Q. I take it the one that is non-preferred is the one that is shown on page 1 of Exhibit 320 with the square; that is, other thermal, burning of natural gas simply to produce electricity; is that correct?

A. That's correct.

Q. Now, aside from fuel and process type are there any other ways that non-utility generation

projects can be categorized?

A. Typically, there are two other ways of categorizing non-utility generation, and they are -- referring to them as either load displacement or purchased non-utility generation.

Load displacement non-utility generation is electricity generated by a customer for their own use, thereby displacing the amount of electricity they would typically buy from the utility.

Purchase generation is generation that is put together or generated expressly for the sole purpose of selling to Ontario Hydro.

Q. Now, Mr. Vyrostko, what do you see as some of the important planning considerations in relation to the development of non-utility generation in Ontario?

A. There are a number of points that I would like to make with respect to the importance of non-utility generation.

The first is that non-utility generation is a viable and a significant supply resource with respect to the Demand/Supply Plan, and, in fact, we are estimating approximately 3,100 megawatts of non-utility generation by the year 2000.

Secondly, as mentioned before, Ontario

Hydro does have a preference for non-utility generation using renewable fuels and/or high efficiency cogeneration, called cogeneration, and we see these preferred options as meeting the increasing requirements of the Demand/Supply Plan.

Third is that non-utility generation using non-renewable electricity-only generation technologies, similar to those used by Ontario Hydro, such as large combined cycle technologies, although we have accepted them to date where they have been economic we will consider for future planning to be part of the major supply plan, and I would like to refer to those now as major supply NUGs.

If we refer back to page 1 of Exhibit 320 the one that Mr. Campbell referred to was in fact the one technology which is major supply NUGs, and the reason why we would see this as forming or being part of the same type of technology, or, in essence, being called a major supply NUG, is that these typically are very large projects using the same type of technology that a utility would use, straight combined cycle, and the impacts that they would have on the environment are typically the same as any utility plant.

So, therefore, from our perspective they are seen to be equal to a utility plant, and,

therefore, we are calling them major supply NUGs.

Q. When one looks in Exhibit 3, the Demand/Supply Plan and sees the designation for a certain type of fossil plant as being CTU-CC, which I understand to be "Combustion Turbine Unit-CC", is that an example of a technology that would be both implemented by NUGs or by Ontario Hydro?

A. That's correct, because "CC" stands for "combined cycle", and, in fact, combined cycle technology is common for the private generation and it is also common for the major utility supply.

MR. B. CAMPBELL: We will be - later in the evidence, Mr. Chairman and the panel - showing you the way these different plants operate.

Q. But, Mr. Vyrostko, I think you also wanted to address some addition at points dealing with how you go about recognizing planning considerations with respect to NUGs?

MR. VYROSTKO: A. Yes, one of the other issues that we feel is important is that Ontario Hydro's forecast of the preferred projects is revisited on an annual basis, and we revisit this forecast on an annual basis to incorporate all the latest project information that we have and any new industry trends that may in fact be materializing.

The final point that I would like to make is that Ontario Hydro's programs and activities are developed to ensure that we obtain the maximum economic preferred non-utility generation to meet system needs, and we do this by reducing both internal and external barriers to the development of the industry.

These are reviewed and assessed on an annual basis to ensure that we do reflect industry trends and practices and Hydro's needs.

Q. Then I would ask you just briefly please to give an overview of what you see as some of the advantages and disadvantages in terms of the Hydro system for the development of non-utility generation. Perhaps start with the advantages.

[10:54 a.m.]

A. There are potential advantages of non-utility generation which, in many cases, are generic and they don't necessarily apply with all projects; that is, some of these advantages may only apply to certain projects.

But in general, we view these as advantages for us. Some of them are things like the small size of non-utility generation projects relative to our own generation make these projects easier to incorporate into the system. And they also have less

Advantages

1

impact on the local communities.

Secondly, geographic dispersion of these projects enhance the system balance and transmission efficiency by matching load requirements with the generation. (2)

In addition typically, non-utility generation has shorter design and construction lead times which better addresses the changing requirements of Ontario Hydro's system. (3)

Finally, there is off-loading of risks from Ontario Hydro to the private sector associated with the development of these projects which benefits the ratepayers of the province. (4)

Disadvantag

Q. All right. And again, just in a very summary way, could you outline what you see as some of the potential adverse impacts associated with the development of NUGS?

A. Some of the potential adverse impacts include increased uncertainty regarding the continued operation of non-utility generation. We have had very good success at bringing projects on stream and into operation, but here in Ontario, some of these haven't been operating for a long time and, of course, the question is, will they be there? And so, one of the issues that we have to look at is, can they be relied (1)

on for the term that we sign contracts for?

Additionally, another potential adverse impact is the uncertainty with respect to the availability and reliability. Most of the non-utility generation projects that we have seen have proven to be as reliable as the major supply options, but again, over the long term, that is a question that has to be addressed as we look at the long term.

In addition, one of the potential adverse impacts is the less flexible system operation that these projects have. Many of them are base load generation which means they operate all the time and they don't turn on and off to meet needs of the system so they are less flexible and typically than some of the other generation that the utility might have on the system.

And finally, there could be less optimal long-term resource mix in terms of how you commit to technologies and fuels such as natural gas over the long term and whether, in fact, all of those choices give you the best optimum resource mix over time.

Q. All right. And on balance having considered those factors, what are the key reasons for Hydro's preference for non-utility generation using renewable resources and/or high-efficiency conversion

technologies?

A. Well, if we look at each one of those terms and opportunities -- let's look first at the renewable projects. These projects typically are smaller projects that, in fact, are much smaller than the Ontario Hydro or a large utility system.

For instance, if we look at Ontario Hydro, it has, in fact, matured as an industry and has focused on building large facilities. Its structure, its expertise is in building major plants.

And so, therefore, to have a utility like Ontario Hydro moving into build a small plant is not very cost-effective. And so, therefore, having non-utility generation building small plants allows for the resources in the province to be effectively used, large facilities by the utility and the smaller size projects by the non-utility generation industry.

If we look on the cogen side, which is the high efficiency technology, cogeneration is an efficient way of using energy resources because, in fact, it does produce two different energies from a single fuel source and it provides benefits for the private sector by improving the economics in their overall operation.

And then lastly, if we look at the waste

fuels generation using by-products such as wood waste has environmental benefits. It facilities waste disposal and we will encourage that whenever an industry or third party developer can make these projects economic.

Q. Now, Mr. Vyrostko, I would like you then to again just in an overview way describe for the Board the stages that non-utility generation has kind of moved through in the province, where it has come from, where you see it now and where you see it going in the future.

I guess I would first like you to -- well, if you could give us just an overview on that and then perhaps a little more detail in each of those areas.

A. I think the best way to discuss the development of the industry is to put page 2 of Exhibit 320 on the transparency. The exhibit is broken down into three time periods; the past, present and future. What I would like to do is basically take the Board through each of those time periods to try to give an indication as to what were some of the developments, what did the industry look like, what were some of the activities in each of those time periods because I think it is important to understand how the industry

has grown in Ontario through that period.

And the other point I would like to make with respect to this overhead is that the panel, both Mr. Snelson and Mr. Brown, will be talking about issues in the past, present and future and so this brings a context to some of the development over that time period.

Q. All right. Now, in terms of - I will do this chronologically - perhaps you could deal with the left-hand side of the slide and the points you want to make with respect to the development of the industry up to about the 1988 period.

A. First of all, the point I would like to make is that non-utility generation is not new in Ontario. In fact, the entire Ontario Hydro system started from non-utility generation; that is, private companies owning their own electrical systems, and then eventually, Hydro purchasing them and basically forming the utility system that we know today.

Traditionally, these non-utility generators contributed to the system to the point where now we have approximately 1200 megawatts of that traditional non-utility generation in the system amounting to about 4 per cent of Hydro's capacity.

Q. That was the situation you found

yourself in by about the '88 period?

A. This was around 1981, '82 as we approached the -- this is where we were at.

These typical traditional non-utility generation projects were initiated by the companies themselves because there was no program with Ontario Hydro. Typically, they were load displacement type projects and they had no contract with Ontario Hydro.

In 1982, Ontario Hydro developed a corporate policy designed to stimulate the growth of the non-utility generation industry.

And shortly thereafter, Ontario Hydro undertook a study called the demand/supply option study which went out and discussed the preferences that industry and customers and the public had towards our overall approach to long-term planning.

Through that discussion, many of the customers identified a preference towards non-utility generation using renewable fuels and cogeneration as something that Ontario Hydro should be pursuing.

So subsequently, the demand/supply strategy was developed and introduced non-utility generation as a high priority to complement Hydro's existing generation at a cost that was equal to or less than Hydro's own generation.

As we were going through the stage of preference being expressed by the industry and by the public, Ontario Hydro around 1985, '86 developed a NUG program using industry information following the introduction of our policy.

At the same time as we were developing this program, we were paying attention to what was happening elsewhere, especially in the United States, with respect to non-utility generation to try to incorporate some of the trends there into our program.

Now, at this time, the program was reasonably simple. We were just starting the program. And the three activities that we had under way at this part of the development were the fact that we did have contract negotiations for purchase-type projects. We were willing to enter into negotiations on a project-by-project basis.

We had an open-door policy for the solicitation of our accepting business development; in other words, if anybody had an opportunity or an idea, they can come and talk to us and proceed from there to develop the project. And we did develop standard purchase rates for projects under 5 megawatts.

And at this stage, as we approached the end of the '80s, most of the projects that we had in

service or committed were small projects. And typically, they were renewable projects using water.

In fact, at the bottom of the transparency we can see we showed at this period of time 42 projects that were in service or committed amounting to 268 megawatts, but except for two projects that were natural gas-fired at that time, all the rest were virtually hydraulic.

Q. All right. And how would you characterize the development of the NUG industry in its current state, you know, and reflecting the activities over the '89 to '91 period?

A. I think I can say that Hydro has established a partnership with the industry to reinforce the development of maximum economic non-utility generation.

Because of this partnership, which we continue to reinforce between ourselves and the industry, we are seeing a great array of players now industry that are now participating.

And today, the non-utility generation industry really includes players such as electric utilities, electricity customers, the gas industry. We have private electricity developers, equipment manufacturers, consultants, contractors, native groups,

private and public institutions. It is a wide spectrum of different players in the industry.

I believe that Ontario Hydro has also matured in this process and I believe we are perceived by many players in the industry, including many from other parts of North America, to be, in fact, leaders among the utilities with respect to encouraging non-utility generation. Specifically, they see us as leaders in the following areas: In the first one, we have adopted a flexible approach for negotiating non-utility generation projects; secondly, that we have a specific program in place to encourage and deal with load displacement type projects.

In addition, we are one of the few utilities that, in fact, assess long-term potential for non-utility generation through the production of an annual long-term NUG forecast.

As well, we have identified and addressed the needs of the industry while ensuring a benefit for ratepayers. In fact, we have developed a balanced approach between Hydro's needs, the ratepayers' needs and the industry needs.

In addition, Ontario Hydro has many non-utility generation project activities in place that reinforce this development, including the solicitation

process, the request for proposal No. 1, which will be discussed later, to proactively seek proposals. We have a well developed communication network dealing with and communicating with all of the industry.

We have a mature costing and negotiating process. We have mechanisms in place to support Hydro's preference for renewable and high-efficiency cogeneration, such as the preference premiums on our purchase rates.

We now have an array of programs which facilitate project development and negotiations. And we monitor these activities on an ongoing way to help us identify a potential for future development to meet system needs.

Now, there has been a rapid development of the industry in a relatively short period of time and that has provided a large amount of megawatts to the system. Part of that has been because over the last year-and-a-half interest rates have improved. We have got our avoided costs increasing and we have applied the preference premiums for some of these preferred projects.

But in essence, the big factor that has made the development of the industry move forward as quickly as it has was the falling gas prices. A year

ago, gas was still predicted by the industry to be increasing at a high rate. In the last year, we have seen the price basically fall and stabilize to the point where now the industry, the gas industry, is looking at non-utility generation as a good business for them.

With this expansion, this increase over the last year-and-a-half, we have seen the development of a variety of projects and they vary in terms of technology, in size, in terms of in-service date and in location. I think with all of this happening, this has brought the industry to maturity.

I believe now that there are a number of large and small players with projects that are operating or under construction that have shown that they are capable and willing to assist Ontario Hydro in meeting its long-term electricity needs.

[11:07 a.m.]

Q. I think you were going to give an indication of the project activity as it sort of stands now?

A. Thank you, Mr. Campbell. I forgot that.

Q. That's what I am here for.

A. That present circumstance now really

materializes in the numbers at the bottom of the present category there where we show there are 74 projects now either in-service or committed amounting to 730 megawatts.

In addition, there are 48 projects that are under active negotiations amounting to 3,500 megawatts, and recently we stated in the speech from the Chair to IPPSO that in that category there are 10 projects that have now formally accepted our price offers and they amount to over 1,000 megawatts.

So, clearly, the present situation shows a lot of activity and a significant amount of megawatts that are coming on board.

Q. Now, Mr. Vyrostko, perhaps I just might ask you to clarify at this point, as I understand it all these figures that you are talking about are in effect over and above the 1,200 megawatts you spoke of as having been developed in the past by the early '80s, basically of load displacement types of projects in private industry.

Am I correct in that understanding?

A. That's correct, Mr. Campbell, because we tend to always deal with the non-utility generation business as the business as it started from about '85/'86 onward, and so the 1,200 megawatts of the

traditional NUGs is always there, and when we talk numbers it is always on top of the 1,200 megawatts.

Q. Okay. Now, I guess against all of that background of development to date what are your expectations for the future?

A. Given the success that we have seen to date our approach now will be to focus on the preference for non-utility generation using high efficiency conversion technologies, such as cogeneration and renewable resource generation for obtaining the remaining balance of the non-utility generation megawatts expected by the year 2000.

In essence, the additional 1,000 megawatts that is remaining to get to 3,100 we would like to focus and prioritize with the renewable and cogen.

Partly we want to do that because, as Mr. Snelson will talk about, there are some limitations to the system. We are reaching the capability of the system to take on more, and, therefore, if there are only certain spots or if there are only certain amounts of non-utility generation that we can take, then we want to ensure that we give them to those renewables and to the cogeneration type of projects that the public has said they prefer us to proceed with.

At the same time as we are looking at these preferred technologies -- and, as I said, we had an open door policy. We went and instituted an open solicitation called the "Request for Proposal".

Last October we went back to an open door policy, and we really have to ask ourselves now as we move forward with the success and as we go towards the 3,100 megawatts: Do we continue to have an open door policy?

Because of the system limitations and the fact that there are only certain locations where we can accept projects we are now starting to look at whether competitive bidding is approaching the time to be instituted, such that we can then use the bidding process to take on megawatts that integrate into our system and integrate with respect to the size of the need, the location, and/or the timing.

Also, as we go towards the future we will continue to prepare the non-utility generation forecast document on an annual basis to incorporate the most accurate and up-to-date information on future industry developments.

We have said before that our forecast is not a ceiling, and our forecast is in fact looked at, as I said before, annually to ensure that we are

keeping up to speed with the industry, and, in fact, we incorporate all trends there.

Then finally, in the future we will continue to identify and assess the need for future programs and policy initiatives to assist industry development.

Q. All right. Now, in looking at the potential for future development of non-utility generation could you identify in addition to sort of the simple and obvious question of "does the system need any more capacity", in addition to that could you identify other factors that influence or you see as potentially influencing non-utility generation development?

A. I see basically three factors that not only have influenced in the past but will continue to influence the development of non-utility generation.

The three factors are the social or environmental factors, the financial or economic factors, and then the operating factors. I would like to take each one of them separately and discuss them in a little bit more detail.

If we take the social and environmental factors, if we look at the environmental side, there are changes occurring to the environment and

environmental regulations in an on-going way both today and in the future, and those changes may have significant impacts on the industry. For instance, there may be as a result of various controls higher capital costs associated with the control technology which then will have impacts on non-utility generation.

In addition, there may be some fuels or technologies that may not even be practical in the near term or the long term. For instance, the government this year introduced a ban on incineration which then changes the activities associated with forecasting of municipal solid waste.

On the other side, on the small hydraulic side, the Water Power Association of Ontario is proceeding with a class environmental assessment process to help facilitate the development of small hydro, and so these types of developments will obviously have impacts down in the future.

On the social side, I mentioned that typically the small NUGs have less impact on the community. In fact, in many cases the NUGs can become part of the community and in fact help and develop the community with respect to either jobs or parks around the development.

But we are starting to see now that even

the small NUGs are not necessarily getting acceptance. We are seeing projects up north that are having blockades associated with some of the development, and so I think from the development of small hydro the non-utility generation industry has to now start to recognize these sensitivities in the communities and start to make that part of the planning process as they develop their projects down the road.

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In terms of the financial/economic factors, financial factors are critical to the project. Obviously, our avoided cost and changes to our avoided costs impact on the project. I think, as I mentioned before, interest rates and access to financing is a significant impact both today and down the road.

The continuation of Class 34, which is the accelerated tax write-off in the Federal Income Tax Act, is a significant factor for renewables and cogen, and, as I said before, the price and the availability of low cost natural gas is paramount to having natural gas-fired projects moving forward.

So there is some uncertainty. There are obviously concerns with respect to some of these financial factors.

On the economic factor, cogen is associated with customers because they do have -- they

are the steam host, and we have seen Ontario and most of North America go through a recession over the past year.

These customers who may have wanted to go forward with cogeneration may not be making that decision now because they just do not have the capital dollars. They do not have the resources to move forward, and so, therefore, as we look to the future and count on cogeneration we really have to be conscious of the economic situation that those customers face and whether they are in fact still prepared to proceed forward with non-utility generation.

Then the last factor is the operating factor, and here we are dealing with issues such as reliability, longevity, how long will the project in fact continue to supply electricity, transmission capacity from an overall utility perspective, and dispatchability.

I mentioned before the need to have a flexible system, and currently most of the non-utility generation projects operate under base load or continual operation, and we now have to start looking at, as we move towards a larger share of the system with non-utility generation, how can we incorporate

dispatchability so that they can be part of the flexible mix of supply options for the utility?

MR. B. CAMPBELL: Now, just before turning to Mr. Snelson, Mr. Chairman, I should advise that with respect to gas availability and those sorts of considerations, including long-term price outlooks, there will be expertise on that matter on Panel 8, which is our Fossil Panel.

This Panel can certainly speak to the impact of price generally in terms of the development, but the actual forecasting, some of the long-term forecasting considerations, and in particular availability considerations, will be the topic of Panel 8 or part of the topic of Panel 8. It will, I think, cover quite a bit of ground.

Q. Now, Mr. Snelson, I would like to turn to you, please, next, and ask you to provide an overview from the position that you occupy in the Corporation with regard to the rationale for including the non-utility generation option as a component in demand/supply planning.

MR. SNELSON: A. Well, as Mr. Vyrostko has already said, there are some technologies for generating electricity which we consider to be better implemented by non-utility generators than by a large

utility such as Ontario Hydro.

There are three technologies in particular.

Cogeneration, it would be difficult for Ontario Hydro to own and operate an electrical generating plant within a steam user's industrial facility.

The second one is small hydro, and, as Mr. Vyrostko has said, --

Q. Sorry, just a moment. I take it on that it is because the customer's primary certain is getting the process heat not the electricity?

A. That is correct.

Q. And the second one?

A. The second one is small hydro in that, as Mr. Vyrostko has already said, Ontario Hydro is not very well structured to undertake small projects effectively.

The third one is burning waste fuels, and generally the purpose of a waste burning plant is to dispose of wastes and the electricity is the by-product of that process, and it makes more sense for the people or the organization with the responsibility of disposing of the wastes to be the proponent of the project and for the electricity to be purchased by

Ontario Hydro.

Again, as Mr. Vyrostko has explained, prior to 1982 then these sorts of technologies were developed by private interests but mostly to meet their own need for electricity as load displacement projects. Ontario Hydro was not taking an active role in encouraging such electricity generation.

Through the 1980s and through the consultations with respect to the Demand/Supply Plan and Demand/Supply Planning Strategy, it was becoming apparent that these technologies were being recognized as more environmentally and socially desirable, and that's why Ontario Hydro is taking active steps and an active role in encouraging non-utility generation.

From a planning perspective we recognize that the system can accommodate private generation, we have done for many years, and that this can be a useful addition to electricity supplies, but there does need to be adequate integration of planning and operation with the rest of the system.

Q. Perhaps you could briefly outline the Demand/Supply Planning Strategy elements that pertain to the development of NUGs?

A. Well, as I have said, the strategy is to promote non-utility generation, and the

Demand/Supply Planning Strategy which was developed in 1989 is included in Exhibit 3, Appendix A, and the complete strategy with its rationale is in Exhibit 74.

Throughout the discussions that went into the development of the strategy, then, it was presumed and I think most participants in those discussions presumed that NUGs would use cogeneration, small hydro, waste fuels and renewable energies. So the strategy elements were written that we would purchase all non-utility generation up to avoided cost, at any cost up to avoided cost.

We also had strategies in there for preference for certain types of technology, preference for renewable energies, preference for high efficiency conversion processes, and those are stated in the Demand/Supply Planning Strategy, and, as we indicated in Panel 3, in 1990 we gave specific expression to those preferences through the use of a 10 per cent adder to avoided cost, and that was discussed in Panel 3.

Now, that 10 per cent adder applies to the preferred non-utility generation technologies that Mr. Vyrostko has mentioned.

In addition, along with the strategy went some statements which we called priority and strategic

directions, which are given on page A1 in Exhibit 3, and one of those priority strategic directions was to encourage non-utility generation, and the way that is interpreted is that we will give preference to developing cost-effective, preferred non-utility generation before we start to develop a major supply.

[11:26 a.m.]

Q. Now, with that background to the strategy, what developments have taken place since the strategy was enunciated that are affecting its implementation?

A. Well, it is now becoming clear that a number of factors are having some effect. We are having a lot of success with our non-utility generation program. And the total amount of megawatts that are being offered to us and coming to contract are beginning to approach the values which we have planned upon in the 1990s. In fact, the quantities that are offered has the potential to create a capacity surplus in the 1990s.

In addition, when you take into account both the quantity and the location of non-utility generation, then there is the potential to significantly affect local and regional balances of load and generation and these are the balances that

determine transmission requirements. And I will discuss those in more detail in later testimony.

The final factor that is affecting the implementation of this strategy is that the non-utility generators are starting to offer projects which are large. They only generate electricity or have a very small part of cogeneration associated with them and they use a non-renewable fuel such as natural gas.

Now, as Mr. Vyrostko has said, such projects are virtually the same as the combustion turbine combined cycle option which is discussed in the Demand/Supply Plan, Exhibit 3, as one of Ontario Hydro's major supply options. And so again, as Mr. Vyrostko has said, we are defining those as major supply NUGS.

Q. All right. Now, is this somewhat changed situation affecting the way in which NUGS are integrated into the electricity system?

A. As far as the preferred non-utility generation is concerned, there is no significant change. The development of non-utility generation from cogeneration, small hydro and waste fuels will continue to receive a high priority.

However, we are having to change our emphasis in two ways to respond to these circumstances:

The first one is that we have to pay more attention to encouraging non-utility generation in the right locations, in the locations that will reduce transmission requirements rather than increase transmission requirements.

And because the major supply NUGS that are being offered are essentially the same as some options that Ontario Hydro might use, then the major supply NUGS are going to be incorporated into planning on the same basis as Ontario Hydro's major supply as part of the major supply part of the plan.

Q. Perhaps you could just briefly outline some of the rationale as to why major supply NUGS are, in effect, being treated in the same way as similar Hydro generation with respect to their impact on planning.

A. As far as their potential effects are concerned, as I have said, these major supply NUGS use technologies which are similar to the same technologies that Ontario Hydro might use. They are likely to have very similar effects in terms of their environmental effects, their social effects, their resource use implications, such as the fuel that they might be using, and the efficiency of fuel use.

And so we feel it is right to the

establish the need for that sort of technology in resource use with respect to major supply options and that who would own the facility is something of a secondary issue in that respect.

Q. All right. And how does this treatment of major supply NUGS in your judgment affect the demand/supply planning process?

A. The process is largely unchanged. This slide which is a simplification of Figure 2.2 of Exhibit 3, and which I also used in Panel 2, is taken from page 3 of Exhibit 320 which we submitted this morning.

The process that we use to establish the need for demand and supply options is that first of all, we try to establish what the load forecast is, which is shown on the top right, and that was discussed in Panel 1.

In Panel 2, we tried to establish the capability of the existing system, which is in the bottom left, and the difference between the two is the need and that the ways of meeting that need are to reduce demand or to increase supply or some combination until we reach a balance.

We can now move forward as shown on the next slide, which is page 4 of Exhibit 320, and this

shows the way in which the need for demand and supply can be reduced and if I use it to define the need for major supply. And so, demand reductions can reduce the need for major supply and supply increases can also reduce the need for major supply.

The load displacement non-utility generation, which is part of the non-utility generation plan, is part of the load reduction and the purchase non-utility generation is part of the supply increase.

The direction we are moving in now is that the NUG plan will focus on the preferred options and that will be discussed further in Mr. Brown's evidence, and the major supply non-utility generation will not be considered to be part of the NUG plan and will not be accounted for in the purchased non-utility generation in the NUG plan or the load displacement non-utility generation. It will be accounted for as part of the major supply plan which is there to meet the major supply need.

The major supply non-utility generation, which is really part of the major supply plan, the discussion of technologies will take place in Panel 8 along with the discussion of the similar technologies that Ontario Hydro would use and the appropriate proportion of the system mix that should come from

these technologies will be discussed in Panels 10 and 11.

Q. Now, against that background, Mr. --

THE CHAIRMAN: Are you going to come to it? Do you have a more precise definition than you have given so far of what constitutes a major supply NUG? If you are going to come to it later, then --

MR. B. CAMPBELL: I think it become clear later, Mr. Chairman.

Q. And Mr. Vyrostko, I want to come back to you and just confirm, however, that for purposes of Panel 5 in terms of those characteristics that affect NUG development, those matters for all of the NUGS remain here with Panel 5.

MR. VYROSTKO: A. That's correct.

MR. B. CAMPBELL: All right. Mr. Chairman, that would be a convenient time if you plan to take a morning break.

THE CHAIRMAN: All right. We will take a 15-minute break.

THE REGISTRAR: Please come to order. This hearing will take a 15-minute break.

---Recess at 11:35 a.m.

---On resuming at 11:53 a.m.

THE REGISTRAR: Please come to order.

This hearing is again in session. Be seated, please.

MR. B. CAMPBELL: Mr. Starkman wants to address something, Mr. Chairman.

MR. STARKMAN: Mr. Chairman, we just had an opportunity at the break and discuss this question of splitting off a part of the non-utility generation evidence in discussion as between Panel 5 and Panel 8, and I just want to register our concern that it not be split off and that at the very least, that we clarify very precisely what we are splitting off because we came here to talk about non-utility generation in this panel. We think non-utility generation is generation by persons other than Ontario Hydro.

And now Ontario Hydro is saying, well, we want to split off the discussion of the environmental impacts and the costs of certain types of non-utility generation to Panel 8, and we just don't think that that is --

THE CHAIRMAN: Those are the things that they characterize as major supply; is that what you mean?

MR. STARKMAN: Exactly, but we see no reason for that split. These are non-utility generation options of one sort of another.

THE CHAIRMAN: Why don't we wait until

Mr. Campbell has completed his evidence and given us the whole picture and then perhaps we will have a better method of assessing that at that time.

Would that be satisfactory?

The idea of the major supply NUG is a relatively new concept to me at least, but perhaps I missed something in going through the material.

I think the thinking of it is it would be counterproductive to deal with both the environmental effects of a so-called major supply NUG and the fossil fuel. They at least should be better all dealt with the same time. That, I take it, is the reason, but let's wait until the end of the Hydro evidence and see how it pans out.

MR. STARKMAN: Thank you.

MR. B. CAMPBELL: I have been asked by Mr. Starkman, Mr. Chairman, just to clarify, and I would ask the panel to correct me if I am incorrect, but as you will see from our evidence included in the additional 1,000 megawatts of NUGS that the panel will be speaking to in the course of its evidence and which have been a result, at least in our submission, as the success of Mr. Vyrostko's division, are a mix of types of projects including, I believe, Mr. Vyrostko - again, correct me if I am wrong - some that are basically

electricity-producing only.

The simple point that we are making here, and it is set out in paragraph 9 of our supplementary witness statement, is that it is just the point you made; that where there are virtually identical technologies, rather than examine them twice, we have said, given that it is the same as the combined cycle combustion turbine units that Ontario Hydro has evaluated in its fossil options, that we want it to be clear that in terms of the specific discussion of that technology and its environmental effects, we propose to deal with that in detail once in Panel 8, which is our fossil panel.

Of course, that technology has always been part of that panel's consideration and what has been explained is that there seems to be a tendency or there have been some projects come forward that are basically of that type as well.

So, that is really the only purpose in dealing with it in this way and, of course, those types of projects have integration issues that arise with them with respect to the system generally that Mr. Snelson has spoken to.

So, I don't know if that clarifies it for my friend, but we really did not want to deal with the

same technology twice.

MR. GREENSPOON: Could I make a comment, please?

MR. B. CAMPBELL: Absolutely.

MR. GREENSPOON: Mr. Chairman, briefly, I have a large problem if what that means is that Mr. Campbell, in defining the parameters of his direct evidence, is putting limits on possible cross-examination. I guess I should say we can maybe deal with that at that time.

THE CHAIRMAN: I think it would be easier to deal with these concerns after Hydro has put in all its evidence in-chief and we can then see what we are dealing with.

MR. B. CAMPBELL: I think that is sensible, Mr. Chairman.

Q. All right then, I think then I want to come back to you, Mr. Vyrostko. Given the reliance that is being placed on non-utility generation by Ontario Hydro, what do you see the development of NUGS entailing in Ontario?

MR. VYROSTKO: A. I think to encourage the development of non-utility generation as a supply option requires Ontario Hydro to be three things: Be flexible, be active and be responsive in dealing with

both the needs of the industry as well as our own needs.

Q. All right. Now I am going to ask you to deal with each of these in turn.

What do you mean what when you say that it is important for you to be flexible?

A. Well, as I said before, we have established a good partnership with the industry and that really has involved a lot of different players and the need to recognize the different needs of those various players.

And because of the array of players there, it requires that we be flexible enough to deal with issues such as the small project that has been built to address specific resource requirements at a certain location to very large projects that, in fact, compete with Ontario Hydro's generation.

At the same time, we are looking at preferred generation which is the renewable and the high-efficiency cogen to those that are non-renewable like straight electricity-producing projects such as the major supply NUGS.

In addition, we have to be flexible because we have to recognize the steam use in industrial plants as well as the electrical consumption

there and we have to be able to balance both the steam requirements and the electricity consumption at those various locations.

In addition, we have seen the rise of third party developers in the province who are coming in to be part of the development of non-utility generation and we have to be flexible in dealing with their needs as well.

THE CHAIRMAN: Sorry, you better say what you mean by third party development.

MR. VYROSTKO: A third party developer is, in essence, an independent developer who has identified an opportunity here in Ontario, whether it has to do with a steam host and he approaches an industrial customer and says, "look I can, in fact, build a project for you and what I will do is I will sell steam to you and I will sell electricity to Ontario Hydro." In other words, he is an independent party, a third party, that now is part of the process.

THE CHAIRMAN: But if he did that, he would be a NUG, his plant; was that not right,

MR. VYROSTKO: That's correct, he is still considered a NUG, yes, yes. But it is just that he has a need now that is different than a steam host and so, therefore, we have to recognize that type of

requirement as well.

And then finally, we are starting to see a number of municipal utilities involved in looking at non-utility generation opportunities.

MR. B. CAMPBELL: Q. All right. And what do you mean when you say you have got to be responsive to the industry?

MR. VYROSTKO: A. We have to be responsive in order to continue to assess the non-utility generation option against other options of Ontario Hydro to ensure that there is a ratepayer benefit.

In addition, we have to be responsive to work together with the industry, to identify strategies that address the needs of both the developer and Ontario Hydro and to communicate those needs regularly as well.

It is very important that we identify the needs of the industry and the needs of Ontario Hydro and share those through a communication process so that we are aware of the requirements that each of us has.

And then finally, I think to be responsive, it requires support that we have to provide to encourage the development and the implementation of non-utility generation projects through flexible and

responsive programs and activities.

Q. All right. And could you explain what you are speaking of when you say you take an active role in all of this?

A. Well, one of the important things in terms of knowing what the industry is dealing with the developers, the various participants in the individual site-specific projects. We take an active part by negotiating with the participants on those projects. Through the negotiation process, we get a better handle on and a better understanding of the unique needs associated either with that project or with the industry.

Secondly, we take an active participation with the industry because it provides us with direct market information with respect to the industry needs and some of the concerns that they have and then allows us to, in fact, introduce programs that respond to those needs effectively.

In addition, active involvement has resulted in a number of my staff participating on either Hydro committees or external committees, and this network of contacts reinforces the ability for us to identify industry concerns and needs. And at the same time, it also helps us to reinforce Ontario

Hydro's commitment with the industry. Finally, as a utility, our responsibility is to serve the customer. Cogeneration is, in fact, an important opportunity for a customer to, in fact, improve his overall energy use and in that way be more competitive within his own industry and stay as a viable industry within Ontario.

So, by having direct contact with a customer, it gives us the opportunity to help that customer understand the opportunities for cogen and, therefore, to improve his long-term operation.

Q. All right. Now can you outline the approach that you have taken to communicating your interest in the development of non-utility generation in the way you have spoken of?

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A. Well, Hydro's means and ways of communicating have to be as varied as the industry itself. And so, therefore, our objective in communicating with the industry includes providing up-to-date information on industry development requirements through pamphlets, various announcements or surveys, by taking opportunities to discuss issues and concerns with other stake holders.

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[12:03 p.m.]

Also, we encourage input into program development requirements at various different

means?

opportunities, and we take the time also to reaffirm Ontario Hydro's role as an active partner in the industry development.

Finally, our communication supports the preferred direction of Ontario Hydro in pursuing non-utility generation as a viable option.

Q. Against that background, what specific steps are taken in the course of ensuring communication with the industry?

A. We communicate with the industry both directly and indirectly, and let me look at -- talk about directly first.

Directly

As I said before, through having specific interaction with individual proponents during the negotiations with each project we have the opportunity to communicate directly with every proponent who comes through our door.

Secondly, we conduct regular workshops with the industry, and it brings the various stakeholders, participants, government, and utilities together to exchange ideas and address current key issues.

Indirectly

In terms of communicating indirectly, we have effective participation through membership on a number of committees, such as the Non-Utility

Generation Advisory Council, the Technical Committee of the Water Power Association of Ontario, Special Sub-Committee of the Municipal Electric Association on parallel generation, and also a former task group of the Ministry of Natural Resources dealing with hydraulic site releases.

In addition, we have indirect communication from membership on a number of associations, such as IPPSO, the Water Power Association, and the Canadian Electrical Association.

Also, we communicate indirectly through our regional customer service representatives who are out there interfacing with the customer on a day-to-day basis, and they provide sort of the eyes and the ears for us to understand what are some of the requirements for the individual customers.

Finally, we communicate indirectly through various market surveys and research programs.

Q. Now, you mentioned a couple of times, Mr. Vyrostko, that one of your important activities is that process of project negotiation.

Why do you see that process as being valuable to you, and I guess as a corollary to that, why do you prefer taking that approach to the business as opposed to simply saying: Here is a standard

contract, these are the terms, sign up or don't, it's your choice? What value do you see to you in the negotiation process?

A. As we started our session after the break we talked about some of the needs that we have with the industry, and one was flexibility.

The objective for us negotiating contracts is to really ensure that that flexibility is there, to address the needs of both the industry and Ontario Hydro on specific projects and also to support the development of maximum economic non-utility generation. So, therefore, negotiation with the industry from my perspective is an important component in our business because a contract is a long-term commitment. We are looking at anywhere between twenty years and fifty years of the contract life.

Therefore, if two parties enter into a long-term commitment like that, it is important that all of the elements of that business transaction be comfortable and acceptable to both parties at the front end, and therefore, negotiations allows us to do that.

In addition, a lot of these projects are involving a lot of dollars, and, therefore, any problems associated with some of the elements of the contract may have serious financial consequences, and

so that it is important that we negotiate those at the front end.

I think the other element is that a contract, as we see it, obligates Ontario Hydro to, in fact, buy electricity from that project for the twenty years or the fifty years. It's a major obligation on our part, and in some cases it is stronger than the developer who isn't necessarily obligated to produce electricity; only if, in fact, the developer sees that as a good business proposition will he do that.

So we want to ensure that when we negotiate the contract all of those elements of those clauses are in fact acceptable to both parties.

The other element of negotiations is that we need to integrate the Hydro contract with all of the other elements of that business proposition, and, for instance, any of these long-term contracts involve fuel supply contracts. They also involve financial agreements. It is important that all of the contracts are sort of coordinated such that they support each other in a good business sense. And negotiation allows us to do that.

In addition, negotiation allows us to optimize the project, to meet the challenge of the affordability for Hydro to purchase the power, as well

as for the developer to be able to construct, finance and operate the project.

It is almost like -- no two projects are alike, and, therefore, I don't think any condition, any contract condition, can necessarily be standardized to provide that same sense of importance to different players, and by negotiating we are therefore allowing us to be a lot more suited to the needs of the individual project and the developer.

The other advantage of negotiating, it offers us the opportunity to balance off some risks and some benefits of the project with the developer such that we can make the project more economic and viable over the long term.

I guess finally we have found to date - and that is over the years that I have talked about, from the past to the present - we have found that this approach to negotiating which matches the needs of Ontario Hydro with the industry has resulted in some very good success stories. We believe that it has brought forward a number of viable projects.

This is not just my view. We have had a number of various developers from around North America who have come to talk to us about projects express the same view to us.

Q. Now, just lest it be overlooked, is it also fair to say though that for smaller projects which you have described as being under 5 megawatts, that there is a standard contract available but that the option of negotiation is also available in that case; is that correct?

A. That's correct. If the proponent for a project under 5 megawatts is looking for something more than just a standard rate, if they're looking for some financial assistance, participating in some other program, then in fact we would then look at negotiating.

Q. Now, can you outline, please, the kind of negotiating or that process that goes on with negotiating projects as you carry it out in your division?

A. Yes, I would like to do that.

If we turn to page 5 of Exhibit 320, on the transparency we can see that there are three key stages to project negotiations.

The first stage is identifying the opportunity, the second one is the project assessment stage where we look for eligibility criteria, and the last one is project approval.

I would also like to draw the Board's

attention to the left-hand side where we talk about three terms that become very common in our communication, and that is what we call an "identified project", which is, in essence, when anybody gives us some sense that there is a project out there in a specific location.

Then the "proposed project", which is in fact, once we have accepted the project, then we are now negotiating it through various stages, it becomes the proposed project, and then finally it becomes a "committed project" after a contract has been signed.

So, our negotiating process and the way we term projects go hand in hand.

Q. Now, perhaps you could deal in a little more detail with what is involved in what you have identified as your first stage; that is, simply identifying the opportunity?

A. Okay. I think the first thing to remember is that the identification of a project can in fact be in response to either a specific request that we may have put forward, like the request for proposal back in May of '89, or it could be in terms of a general response to our desire to acquire projects under the maximum economic objective that we have.

The opportunity though to identify the

project rests with the proponent. They, in fact, choose where they want to put the project, the type of technology, what type of fuel will be used, and timing of the project.

So what happens then is the proponent submits an application to Hydro with the particulars of the project that he has at the time. Once we receive that application we would then review it, discuss it with the proponent, and provide some preliminary information such that the proponent then can go back and start looking at some detailed assessments and some detailed designs.

For instance, we would talk in general about what is required for a connection requirement, what are some of the generic purchase rates out that may be available for that project. We would look at any technical advice that we can possibly give the proponent to help with that project, and we would also look at some pre-feasibility assessments, whether in fact the technology or the location or the type of fuel is appropriate for the proposal that the proponent is looking at.

At the same time, if the project involved for instance a steam hose and there would be some -- or there might be some further requirements needed in

terms of detailed information, or if the proponent was thinking of possibly taking advantage of the financial assistance program that we have, we would be asking the proponent to look at a detailed consulting study, and at the time we would be talking about some of the issues that are necessary for the consulting study.

So once we have been able to provide this general information to the proponent they will then take that information back and now go through a formal proposal submission to us.

Q. When you get those kinds of submissions how do you go about assessing those projects?

A. After he or she has put together this formal proposal we would then look at it to ensure that all of the information that we have specified in our request for proposal document, which was attached to Interrogatory 5.14.64, to ensure that all that technical information is included, and that information deals with the type of technology, the type of fuel, the in-service date.

We would be asking for a sense of amount of electricity that will be generated on-peak and off-peak. We are looking for a sense of what the economics and the financial responsibilities of the

parties are. We would be looking at the type of fuel and how they expect to procure the fuel, and we would also be looking at whether there is a schedule for addressing environmental regulations and obtaining necessary permits.

MR. B. CAMPBELL: Mr. Chairman, if we could have as 321.1 the interrogatory that was referred to, which was 5.14.64.

---EXHIBIT NO. 321.1: Interrogatory No. 5.14.64.

MR. CAMPBELL: Q. Now, the last point, Mr. Vyrostko, you mentioned in that list of considerations was environmental matters. What is Hydro's role during project negotiation in the area of environmental impacts?

MR. VYROSTKO: A. Well, the first point is that the NUG developer is responsible for ensuring that their project is developed in an environmentally responsible manner.

When the project opportunity is identified and we receive an application we would then refer the proponent to the appropriate government agency to facilitate the request for and the completion of all the necessary environmental reviews and permits.

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Then, once that information has been received by the proponent and he has met with the

government, upon the submission of the proposal back to Ontario Hydro as a formal proposal Hydro requires therefore at that time that there is a schedule submitted that addresses all of the environmental regulations and discusses all the necessary permits that that proponent is aware of.

Q. Now, if we can go back to your slide then, all of that having been done what is the next step.

A. Now we are at the stage where the project is accepted, so now at this stage Hydro would be providing a detailed connection requirement and outlining the costs necessary for incorporating the project into the system.

At this stage also is when Hydro would be looking at whether the project can be incorporated onto the system, the transmission system.

Then we would continue, and if the project now has acceptance onto our system we would then discuss illustrative rates and start talking about other financial requirements and/or any of the financial assistance programs that we have available for the project.

At the same time, if there is other technical information that has to be shared between

either ourselves or the proponent are done at that time.

At this stage we have a lot of detail on the project and we are now in a position to be able to, with the proponent, look at whether there are some risks and benefits that can be transferred between either Ontario Hydro or the developer to make that project a viable project.

Now, after having gone through all that information, the proposal typically would then be what we would consider "optimized" in that the proponent would have learned some information and would then have gone back and revised their proposal to some extent, whether it has changed the size somewhat or maybe deferred it or brought it forward by a year or so, or looked at some of the smaller details to make that project fit the overall affordability design between ourselves and the proponent.

Then once all of these have been put together and everything looks acceptable, a formal offer would be then placed on the table, and that formal offer can either come from Ontario Hydro or from the proponent.

Once the offer has been reviewed by both parties then it could be either accepted or rejected by

either party. If it is rejected, then we would try again to see if by working with the proponent we can reoptimize and do some more maybe with the project to see whether in fact the project can fit within all of the affordability criteria.

Finally, we would get to the stage where the formal offer now has been accepted by the proponent, and then we would take that formal offer to our Executive office for approval as well, and once the approval now has been obtained by both parties we would proceed to finalize the contract, and at that time we would consider the project committed.

Q. All right. Now, do all projects go through, in a general way, this kind of negotiation process that you have outlined?

A. All projects that we have, whether they are large or small, would in fact go through the first stage, which is the identification of the opportunity, and then the preliminary discussions with us and some of the sharing of information with respect to connection costs and/or some generic rates or some general advice that we can give the proponent.

However, since projects under 5 megawatts are much smaller than the larger ones, the dollar value is much less, the need to be as critical in terms of

fitting the various needs of the project are not quite as important because the projects typically are simpler.

Therefore, we have developed a standard contract for projects under 5 megawatts and also we have developed standard purchase rates that then facilitate and make the overall administration and the development of those types of projects much easier.

However, as we discussed previously with Mr. Campbell's question --

THE CHAIRMAN: What is your standard process rate? What is your standard for less than 5 megawatts?

MR. VYROSTKO: We have standard purchases rates?

THE CHAIRMAN: Yes, what is the standard purchase rate? You say they are rates or one rate?

MR. VYROSTKO: No, we in fact have -- there are three different options to the rates.

THE CHAIRMAN: You are going to get into that later?

MR. B. CAMPBELL: We hadn't thought of going through that in detail, Mr. Chairman. They are published and we can file that rate schedule, if that would be of assistance to you.

THE CHAIRMAN: Well, all right. It's up to you.

MR. B. CAMPBELL: Holy smokes. If I have to give the first undertaking I am going to be really peeved, but I guess I better do that.

We will take an undertaking on that to --

MR. SNELSON: Maybe I can help you, Mr. Campbell. The latest under 5 megawatt rate is given in Interrogatory 5.14.6.

THE CHAIRMAN: Did you happen to see what it is? I am just curious.

MR. SNELSON: I would have to pull it out to find the number.

THE CHAIRMAN: All right.

MR. B. CAMPBELL: I'm sorry, what was the interrogatory number again?

MR. SNELSON: 5.14.6.

MR. B. CAMPBELL: And that will be 321.2.

---EXHIBIT NO. 321.2: Interrogatory No. 5.14.6.

MR. B. CAMPBELL: Q. Perhaps, Mr. Vyrostko, you could just give some of the figures that are in your standard published rates for 5 megawatts or less projects?

[12:25 p.m.]

MR. VYROSTKO: A. In essence, there's

three options to the rates. One is the general option which is applicable to all projects. And by the way, all three options are, what we call, the time differentiated rates. There is a different rate for the different time periods based on summer peak and winter peak and summer off-peak and winter off-peak.

And so that really varies from 7.36 cents for winter peak, which is the most expensive and most valuable time for us, to 2.66 cents for a summer off-peak which is the least valuable for us.

Now, option 2 which is the same rates but with the preference because we do have a 10 per cent preference for a renewable, in essence is just taking 10 per cent and adding that to those projects. So, therefore, again, the winter peak would be 8.1 cents per kilowatthour and the summer off-peak would be 2.93 cents per kilowatthour.

And then the third option that we have is an option that gives basically a flat rate for projects over a ten year period and we do this to stimulate the development of small renewable projects. And what that does, that helps with the financing because, in fact, you are getting paid more at the earlier years and, of course, that rate stays the same for all ten years.

And that rate is, again for those two

periods that I talked about, is 9.81 cents per kilowatthour for the winter peak and at 3.55 cents for the summer off-peak.

Q. All right. And as you have mentioned where - as I understand from what you advised earlier - financial assistance from Ontario Hydro comes into the picture, that is where you would tend to have some departure from the standard contracts for under 5 megawatt projects and those might well go through the same negotiation process.

Do I have that right?

A. That's correct. Mr. Brown will get into a little bit more detail of the financial assistance program, but when we do that we, in fact, are now negotiating.

Q. Okay. Now, turning to those purchase rates, I guess, briefly, could you describe how purchase rates for non-utility generation are determined?

A. Purchase rates currently are determined using project appraisal system incremental values applied to specific projects. These take into account the considerations discussed earlier in Panel 3 and account for transmission system credits and losses as well.

There are two components included in calculating the purchase rate: Component 1 includes the determination of what we call a basic avoided cost; and component 2 accounts for the application of the preference premium for generation using renewable resources and/or high-efficiency conversion technology like cogeneration.

Q. How do you apply the basic avoided cost in determining the NUG purchase rate?

A. The basic avoided cost for the project is determined by applying the system incremental values, or the SICs as they are referred to, to the power, to the megawatts and the energy, which is the megawatthours, expected to be delivered by the project over the term of the proposed contract.

The basic avoided cost is influenced by such things as the proposed in-service date of the project, the term of the contract, the correspondence of the power and the energy deliveries with the peak and off-peak demand periods of the power system and the degree to which power and energy deliveries can be dispatched or curtailed by Ontario Hydro.

And because of all of these different variations in the project, it is very difficult to compare specific avoided cost or purchase rates from

projects solely based on those rates.

In addition, this basic avoided cost includes adjustments to account for transmission losses and credits.

Q. All right. And then against that background, how do you apply the preference premium?

A. The preference premium, which is up to 10 per cent of component 1, is offered for projects or is based on one of the following considerations: We will provide a 10 per cent adder for all projects that are based on using one of the following types of fuels: Renewable energy resources such as solar, wind, water, or forest biomass or waste product fuels, such as municipal solid waste, wood waste or industrial, commercial or agricultural waste products; and the third one is waste heat recovery.

The second option is that we will provide an adder of up to 10 per cent for all energy-efficient projects which use non-renewable fuels for other than combustion support.

The adder will be based on the degree to which non-renewable fuels are used to produce electricity more efficiently than typical utility fossil-fueled plants, and this typically would be applied to the cogeneration facilities.

Q. All right. Turning then to you, Mr. Brown, could you please identify some of the programs that are presently used to support the development of the non-utility generation industry in Ontario?

MR. BROWN: A. To put our programs in perspective, I think it is important to reiterate a statement that Mr. Vyrostko made earlier, in that it was just a few years ago we had very few programs. One of the ones we did have then was the standard rates which we already described to the panel today.

But industry essentially developed on their own. It is only in the last few years Ontario Hydro has increased the emphasis on developing programs.

Today I would like to elaborate on four significant programs that are in operation today. One is our request for proposal process No. 1. It is one of our solicitation processes that is winding down.

No. 2, we have our consultant assistance program to assist in determining project feasibility.

Three, we have a financial assistance program, which was mentioned earlier, which provides assistance to the load displacement projects, but also provides flexibility for purchase type projects.

And four, we are involved in a government

audit program to identify cogeneration opportunities in the government sector.

Q. All right. I would like to discuss each one of these in turn and ask you to first outline what were the objectives of RPF No. 1, request for proposal No. 1, and how did that process work.

A. Our objectives for request for proposal No. 1 was to communicate our interest to the non-utility generation industry to specify our proposal requirements, our connection requirements, and formalize these in more detail.

We requested specific in-service dates, and for request for proposal No. 1, this is December 31st, 1994. We will take all projects under avoided cost.

Q. Okay. Now those being sort of the basics of request for proposal No. 1, what was the response and what is the status of whatever interest has been shown in this request for proposals?

A. As was mentioned, request for proposal No. 1 started in May, 1989. Response was a lot greater than we expected. By the proposal deadline of January 25th, 1990, we had 39 proposals representing some 6500 megawatts.

At this time, we have 68 megawatts of

committed projects, 1,200 megawatts that have accepted Hydro's rate offer. Most still require senior management approval. And we have 700 megawatts that are in the final stages of negotiation.

Q. All right. If you could move then to the next program that you mentioned, could you outline the purpose and results of the consultant study assistance program?

A. The consultant study assistance program provides assistance for consultant studies to identify the technical and economic potential of proposals. Our interest in this program is to take steps to ensure the risks of a project are adequately assessed prior to financial commitments, especially if financial assistance is being considered by Ontario Hydro. The assistance is available to all projects to meet Ontario Hydro's pre-feasibility criteria.

Eighteen projects have taken advantage of this program to date. Seven out of these 18 projects representing 173 megawatts are either in service or committed to be in service. Several others are still in negotiation stage at this time.

Q. Now, turning to your financial assistance program, again I would ask you the same question; could you explain briefly what it is and how

it works?

A. The financial assistance program provides a means to access more projects that are economic. It is especially designed for load displacement projects which do not have a rate offer because essentially they are not selling any to Ontario Hydro, but it also provide financial flexibility for developers of purchase type projects.

But although the financing may vary from project to project, the cost to Ontario Hydro is still the same. It is below avoided cost. And our premise is that to combine assistance, the financial assistance and the purchase rate must not exceed the project-specific avoided cost less any lost revenue.

The program is offered in six options: Advance payment, which is very similar to the option 3 standard rate Mr. Vyrostko earlier identified, where we pay more in the earlier years and recover in later years.

The second option, guaranteed payment, which is directed at hydraulic projects, provides a minimum cash flow regardless of monthly performance.

The third option, is performance payments which directed at load displacement projects. We will provide periodic payments based on minimum performance

criteria.

The fourth option is low interest loans for Ontario Hydro.

The fifth option, we will buy down loans from external institutions.

And the sixth is we will assist in natural gas procurement using one of the above options, such as a low interest loan or buying down a financial institutions loan.

To date, ten projects representing some 200 megawatts have taken advantage of this program.

Q. All right. And finally, Mr. Brown, in the fourth program, you mentioned what involvement does the division have in the government audit program.

I take it here this is the same audit program that Ms. Fraser spoke about on Panel 4 that operates at both the federal and provincial level.

A. Yes. It is very important to point out that this program is really an energy management program that was already discussed in Panel 4 by energy management. Our involvement is to identify cogeneration opportunities in the government sector.

It is the same auditors used in the energy management process except there are screened buildings for cogeneration opportunities. Of those

screened, we perform pre-feasibility studies to identify those that require further study.

Once a building has been identified as being an economic potential, we will follow our normal negotiation process.

To date, as you must have heard in Panel 4, about 1,000 provincial buildings have been audited and 700 federal buildings have been selected. Twenty of these have been screened by auditors to date as possibly having cogeneration potential.

Other than some existing district heating and cooling opportunities that already came to Ontario Hydro, none of the twenty have resulted in new proposals.

However, we are hopeful through this program that we will be able to identify new sites where this program will move government projects into our negotiating process.

Q. All right. Now, what additional activities are being considered by way of programs in the division for the future?

A. We have the following activities underway: One, to address load displacement concerns about back-up power, the simultaneous buy/sell, to enhance the role of municipal electric utilities in NUG

development, to assist the Ministry of Natural Resources in expediting hydraulic site releases, to develop new solicitation processes such as competitive bidding to better match NUG development with system need, to promote NUG development in remote communities, to promote small load displacement projects similar to our standard 5 megawatt rates, and finally, to support a development of promising alternate technologies used for electricity generation.

Q. All right. Now I want to come back to you, Mr. Snelson, and deal with some of the integration issues that are associated with NUGS.

Can you tell us generally what is required to integrate NUGS into the electricity system?

MR. SNELSON: A. There are quite a range requirements necessary to integrate non-utility generation together with the other generation transmission and distribution into an effective system to meet electricity needs.

There are two sort of general classes: The first one is the physical interconnection to carry electricity to the newest part of our system; and the second one, the wider requirements to coordinate with other parts of the system including the regional transmission supply system, the bulk electricity

transmission system and the generation system.

The first one, the interconnection, covers those facilities directly attributable to the non-utility generation, such as the transmission line to the nearest point on the system, changes to switching and protective systems to connect the non-utility generator.

These connection requirements are part of the negotiating process which has already been discussed by Mr. Vyrostko and I won't discuss further.

My evidence on integration focuses on the broader requirements to coordinate with the rest of the system, including coordination in planning, design, and operation.

For small non-utility generation and cogeneration, the integration requirements are generally kept to a minimum. We have to recognize that the non-utility generator often selects the location, the size, the timing and the operating pattern to suit some non-electrical use of the facilities, and those factors cannot be chosen to suit the electricity system. So that is one reason for keeping the integration requirements to a minimum. And the other one is that these are generally the preferred technologies that we are trying to encourage.

For the major supply NUGS then the integration requirements are similar to the requirements of similar utility generation. As the industry becomes a more significant proportion of the generation on the system, we have to pay more attention to the integration issues for these major supply NUGS.

When you come to the integration requirements, I have said that it affects the regional system, the bulk electricity transmission system and the generation system. Then in these three parts of the system, the general objective is the same, but the actual details of the requirements are somewhat different, so I will deal with those factors one at a time.

Those factors are those associated with the local area requirements for the regional supply system, the inter-regional requirements of the bulk electricity transmission system and the system-wide considerations for the planning and operation of generation.

Q. All right. I would like you to deal with each of those three categories one at a time.

First, can you tell us the integration considerations that tend to be specific to the regional supply system?

A. The detailed evidence on transmission, both the regional and the bulk electricity transmission, will be given in Panel 7, but I can give an overview of the implications for non-utility generation.

Assuming that the non-utility generation plant is connected to the regional supply system, there are a number of factors that have to be taken into account in integrating into that system. These factors include the effects on voltage levels. Any generation must be operated to maintain acceptable voltage levels in the area for customers. This may require contract terms that affect the design and operation of the generator.

This type of requirement is likely to be more important the larger the proportion of the load in the area that is supplied by the non-utility generator.

Another factor that must be taken into account is reliability. The design of the local system must account for the expected degree of reliability of the non-utility generator to maintain reliable supply to customers. This is particularly significant if the non-utility generator has one unit that is a large portion of the supply to that area.

And then there is the effect on the

regional load and generation balance. This is dynamic in the sense that load and generation are constantly changing; however, in general terms, if an area has more load than generation, the non-utility generator will improve the balance and tend to reduce requirements for transmission and also reduce transmission losses.

[12:45 p.m.]

On the other hand, if the area already has more generation than load the non-utility generator will tend to increase regional requirements and losses.

We gave some general information on this in answer to Interrogatory 5.14.111, and this shows the province east and south of Sudbury and identifies preferred locations for non-utility generation from a regional transmission perspective based on existing in-service non-utility generation and existing and committed transmission.

This is page 6 from Exhibit 320.

Q. All right. If we could just note that Interrogatory 5.14.111 should be added to the list as 321.3.

---EXHIBIT NO. 321.3: Interrogatory No. 5.14.111.

MR. SNELSON: Now, the slide shows preferred areas.

THE REGISTRAR: .2?

THE CHAIRMAN: I think 3.

MR. B. CAMPBELL: .2 would be 5.14.6.

THE REGISTRAR: Thank you.

MR. SNELSON: The slide shows preferred areas which are the main load centres shown in red on the slide and by a distinctive hatching in the hard copy, and it shows that load centres such as Toronto, Ottawa, Kitchener, London generally have less generation than load and that from a long-term balance for those areas more generation would be beneficial.

Least preferred areas are also indicated as red areas in the slide and diagonal hatching in the hard copy, and these are areas that already have more than sufficient amount of generation.

As discussed in the interrogatory, these areas of preference are expected to change over time with the addition of non-utility generation projects, other changes to generation, load growth and their cumulative impact on the bulk electricity system.

MR. CAMPBELL: Q. All right. Now, could we turn then to the impact on the bulk electricity transmission system, which was the second part of this system integration issues you referred to.

MR. SNELSON: A. The integration

concerns for the bulk electricity transmission system are similar in principle to those for the regional supply system.

However, the areas of the system where balance must be maintained are larger and the flows on the transmission lines are less directly a function of load in the area. Transmission line flows also depend heavily on the scheduling of generation, much of which is connected directly to the bulk electricity system, transmission system, and it also depends upon flows to and from interconnected utilities.

A few general points before discussing specific transmission effects, the lead times for building non-utility generation and the lead times for building transmission do not match. Most of our non-utility generators can add projects to the system in the order of 2 to 3 years, and that is with the approval processes that they currently have to follow.

For transmission additions the lead time tends to be of the order of 5 to 10 years, and a large part of that is due to the long approval processes applicable to Ontario Hydro transmission.

So given those factors, then, in the 1990s non-utility generation must be incorporated into the transmission system with the following facilities;

that is, the existing transmission system, plus transmission that is already approved, plus transmission upgrades that can be undertaken without major approval processes.

So, in the 1990s, it is possible that the transmission may be somewhat restrictive and may affect the preferred location and size of non-utility generation.

In the long term, the transmission can be built to accommodate non-utility generation just as it can be built to accommodate Ontario Hydro generation. We do need to have better mechanisms to include transmission considerations in non-utility generation planning to influence siting, where that's flexible, and to reflect the cost implications of location from a transmission point of view.

Q. Now, the other matter you spoke of was interregional transmission limits and how or what limits are there that exist that may affect NUG development in the '90s.

A. There are five interregional transmission limits that may impose constraints on non-utility generation in the 1990s, and these can be seen by reference to Figure 4-1 of Exhibit 3, which is reproduced as page 7 of Exhibit 320.

Most of these --

Q. Sorry. Just when you say that, the 4-1 in Figure 3, it is a similar one, but I take it given the January, '91 date that page 7 is a current version? Bottom right corner?

A. Yes, I am looking at the date and then I am looking at what is shown on the slide. And yes, it is an updated version.

Q. Okay. All right. If you could go through the limits, please?

A. Yes, and these limits are mostly limited by 500 kV transmission, although in some cases the 230 kV transmission has some effects.

The first limit I wanted to refer to is a west to east limit across the north of Lake Superior, which is really the top left-hand corner of the main slide or the right-hand side of the inset, towards the right-hand side of the inset which shows the west system.

With recent additions to capacity on the west system, part of which is non-utility generation, we are now in the situation where we expect to have more generation than load in that general area of northwestern Ontario that is west of that area, so we are talking about Thunder Bay and west.

And so, with more generation in that area than load the predominant flows on that transmission are from the west to the east, and at present there is one double circuit, 230 kV line through that area, and the loading limits on that line may affect the amount of non-utility generation in the northwestern part of the province.

The second area that may be limited by transmission is between Timmins and Sudbury. At present, the main line is a single circuit, 500 kV line, and you will notice that the Moose River generation is north of that. That line and the loadings on that line are affected by additional non-utility generation and additional hydraulic generation in the area around Timmins, Kapuskasing and to the north, including the Moose River Basin, and the flows there are predominantly from north to south.

The third limit is between Sudbury and Toronto. At present, there are two single circuit, 500 kV lines, and the flow tends to be south at peak times because of peaking hydraulic generation in the north, and it tends to be north at nighttime when the peaking generation is shut down.

We expect that the flow south will be limiting as additional generation is added in northern

Ontario, both northeast and northwest, and as the Manitoba purchase comes into the picture. So this transmission corridor affects all non-utility generation in the northeast and northwest parts of the province.

The fourth transmission limit is generally to the west of the Greater Toronto area. If you can think of an imaginary line drawn between Hamilton and Georgian Bay and power flows that cross that line, then that's approximately the part of the province that is limited.

There are several existing 500 kV and 230 kV transmission lines in the area, and the flow that is of concern is from the west to the east, and that can affect additional generation, including additional non-utility generation in southwestern Ontario.

The fifth and last transmission limit that we have identified is one that runs through the Metropolitan Toronto area, generally to the north of the Metropolitan Toronto area, and you can think of it as being limiting to flows that sort of cross Yonge Street.

There are several existing transmission lines at 500 kV and 230 kV in that area, and the concern -- the flow that is of concern is that at times

that transmission is fully loaded or will be fully loaded from the east to the west, and that can affect non-utility generation to the east of the Metropolitan Toronto area over to Ottawa.

Q. Now, Mr. Snelson, given these limits, is it going to be possible from a transmission viewpoint to incorporate the 3,100 megawatts of non-utility generation by the year 2000, or by 2000?

A. Yes. Yes, we believe it will be possible but that careful integration with the transmission system is required.

In order to incorporate that amount of generation and depending on where it is located, before the year 2000 and before we can add major new transmission lines we may need some temporary solutions to these transmission limits with the sorts of arrangements that are acceptable in the short term but not acceptable in the long term.

As we approach and pass the turn of the century we have some plans for additional transmission facilities which will alleviate some but not all of these bottlenecks, and that that will enable us to accommodate some additional non-utility generation.

Given that transmission capability is somewhat limited, then we are adopting the approach --

and this is consistent with the approach that we have been talking about. We are adopting the approach of reserving that limited capability for the generally preferred non-utility generation, also recognizing that most of these technologies don't have the flexibility to choose their siting to suit the needs of the electricity system.

When it comes to actually putting megawatt limits on the flows that will be permitted and the additional amounts of non-utility generation at any point in time that would be acceptable, then this is a somewhat complicated matter.

It is continually changing. As the load grows in a given area, then more generation in that area can be accepted. There are uncertainties with other resource developments that affect the transmission limits, and the transmission system itself is evolving over time as improvements are made.

We also are affected by the developments on the interconnected systems that we are interconnected to.

So this is somewhat complicated, and Panel 7 will have a transmission planning witness who will be able to deal with this topic and will have available the latest information.

Q. Now, the third part of the system you referred to was the generation side of it.

Maybe before getting into the generation side of it this would be a good time to have the lunch break?

THE CHAIRMAN: Adjourned until 2:30.

THE REGISTRAR: We will adjourn until 2:30.

---Luncheon recess at 1:00 p.m.

---On resuming at 2:33 p.m.

THE REGISTRAR: Please come to order. This hearing is again in session. Please be seated.

MR. B. CAMPBELL: Thank you, Mr. Chairman.

Q. Mr. Snelson, just before I turn to this generation question, I want you to clarify one thing for me, please.

Just prior to the lunch break, you indicated that - you were discussing the lead times for non-utility generation versus transmission additions and you said the NUG lead time was about two to three years.

Do I understand that to be from the time of the project commitment? That isn't sort of the whole of the process right through to in-service, but

the two to three years represents what?

MR. SNELSON: A. The two to three years does represent from project commitment to in-service and the time to negotiate the project is in addition to that.

Q. Okay. Now, the third part of the system you referred to as requiring careful integration considerations was the generation.

Can you outline for the panel, please, the integration requirements as far as the generation system is concerned?

A. There are three main considerations with respect to integration from a generating system point of view. The first one is with respect to economic integration into planning. And the tool that we use for that is avoided cost and that has already been discussed in Panel 3 so I won't discuss it further here.

The second question is with respect to the load and capacity balance from a planning perspective and the third --

THE CHAIRMAN: Load, what?

MR. SNELSON: Load and capacity.

THE CHAIRMAN: Load and capacity.

MR. SNELSON: And the third one is with

respect to operational flexibility.

MR. B. CAMPBELL: Q. All right. Now, I am going to ask you to illustrate the load and capacity considerations by showing how the new NUG figure of 3100 megawatts by the year 2000 affects the balance between load and capacity. If you could go through that for us, please.

MR. SNELSON: A. Yes. And if we quickly review the conceptual figure that was page 4 of Exhibit 320 which shows how demand management NUGS, hydraulic and purchase NUGS can contribute to reducing the need for major supply, we have now come to the point where we can start to put some numbers to this figure, which is the next slide.

This slide is a load and capacity balance for the end of the year 2000. It is shown in the attachment to the supplementary witness statement which, I believe, was given the exhibit number of 319 and it is reproduced as page 8 of the overheads for this panel, Exhibit 320.

And it has been reproduced with two corrections: A minor arithmetical error of the order of 30 megawatts has been corrected and the asterisks for the notes were incorrect on the original and are now correct.

This figure includes all of the information to date. It includes the demand management estimates from Panel 4, including the 3500 megawatts of electrical efficiency improvements in fuel switching. It includes the NUG estimates from this panel, which are based on the 1990 NUG plan, plus 1,000 megawatts of extra purchase NUGS. And the load displacement is part of the demand reduction.

THE CHAIRMAN: You are going too fast for me.

What is based on the 1990 NUG plan?

MR. SNELSON: The line in the demand reductions that says load displacement of 248 and the --

THE CHAIRMAN: All right. Which you said --

MR. SNELSON: Which is directly taken from the 1990 NUG plan.

THE CHAIRMAN: That is net of retirements forecast of natural NUG?

MR. SNELSON: That is correct.

THE CHAIRMAN: And plus a 1,000?

MR. SNELSON: And the purchase of non-utility generation which is shown in the supply increases as 2,593 is 1,000 megawatts larger than the

corresponding number, in the 1990 NUG plan.

These two numbers do not add to 3100 megawatts because of the effect of the natural load displacement NUGS and the retirements, which are covered in the 1990 NUG plan. But in terms of new, then it does account for the 3100.

THE CHAIRMAN: Well, let's just take it a little easier.

MR. SNELSON: Okay.

MR. B. CAMPBELL: I knew this one was going to be a problem.

THE CHAIRMAN: Let's start with the 2593.

MR. SNELSON: Yes?

THE CHAIRMAN: Which NUG plan is that related to?

MR. SNELSON: It is taken from the 1990 NUG plan.

THE CHAIRMAN: Yes?

MR. SNELSON: Which shows a figure for purchase non-utility generation of 1,593.

THE CHAIRMAN: Yes?

MR. SNELSON: And because we are now planning on 1,000 megawatts more, 1,000 has been add today that number and it is shown at 2,593.

THE CHAIRMAN: So, if we want to put a

plan number on that, would you say it is this plan that is coming up at this hearing? Is that what you are saying?

MR. SNELSON: It is our way of showing, at this time, the effect of the 3100 megawatts.

Mr. Brown will be talking about the specifics of how he comes to the figures that are in the 1990 NUG plan and his expectations of what will come about in the 1991 NUG plan.

THE CHAIRMAN: All right. And then the load displacement NUGS are 248; is that right?

MR. SNELSON: That is correct. And if you add 248 to 2,593, you get a number that is somewhere a little over 2,800 megawatts.

THE CHAIRMAN: Yes?

MR. SNELSON: And the difference between that and 3100 megawatts, which is, in fact, the total new NUGS, is the allowance for some of those NUGS having been expected to occur naturally and being accounted for in the basic load forecast and a small allowance for some retirements of existing non-utility generation which is mostly load displacement non-utility generation.

So, the net increase that was shown in the 1990 NUG plan was 248.

THE CHAIRMAN: So, the plan that you are presenting today as at this moment - that is, October first, 1991 - is 2593 plus 248; is that right?

MR. SNELSON: That is correct, and it corresponds to the chair's announcement of 3100 megawatts having taken into account these other effects.

THE CHAIRMAN: All right.

DR. CONNELL: Can we have the original reference of which this is an update?

MR. SNELSON: This was attached to our supplementary witness statement.

Is that the original reference you are referring to?

DR. CONNELL: Yes.

MR. SNELSON: And it is attached to the supplementary witness statement, which is Exhibit 319, I believe. It was given that number this morning.

MS. PATTERSON: And there were no footnotes on the original one; is that right?

MR. SNELSON: There were footnotes on the original one, but the four stars' note was incorrectly placed. The note was there, but the four stars were in the wrong places.

And the sum of 5481 megawatts of demand

reductions on the right-hand side, halfway down, I think it was 33 megawatts less and it was the incorrect addition of the four numbers on the left-hand side, and that was then reflected also in the total at the bottom.

MR. B. CAMPBELL: So, to prevent myself from making a previous faux pas, my recommendation would be to recycle that attachment and use these figures.

Q. Now --

MR. SNELSON: A. I think I was partway through.

Q. Yes. Where are we here?

A. I think I explained that the updated demand management and non-utility generation numbers were included in this figure.

Also included are the Hydro electric options which will be discussed in Panel 6 and so we are getting a little ahead of ourselves. And what is shown here is consistent with the changes that Mr. Campbell advised you of on September the 24th.

And the in-service capacity that is shown in this year at the end of the year 2000 for hydraulic is the same as in Exhibit 3, the Demand/Supply Plan, except that it only shows the Mattagami redevelopment

in the Moose River Basin and Patten Post, which has been advanced in response to government direction with respect to their regional economic initiative in the Elliott Lake area. Patten Post is now planned to be partly in service at this time.

And the remaining item that is included is the start of the Manitoba purchase. At this particular time, the Manitoba purchase will not be fully in service, but the first 400 megawatts would be available at this time.

So, we can summarize that information with respect to whether we have a surplus or a shortfall, and that was included on page 8 of our supplementary witness statement, Exhibit 319, and it is reproduced here as page 9 of Exhibit 320.

This has figures taken from the previous figure rounded to the nearest 100 megawatts or the nearest .1 of a gigawatt. And all the numbers on this table come from the previous one except for the bottom line which shows a surplus or shortfall.

So, what this shows is that if all our plans for the 1990s are approved and implemented with no delays, then under median low growth, we would have approximately 2,600 megawatts of surplus by the end of the year 2000.

Recognizing that we also have strategies to be prepared to meet upper load growth, with the upper load growth as shown in the Demand/Supply Plan, we would have approximately a 2,000 megawatt shortfall. And with the current estimated upper, we would have a 3,400 megawatt shortfall.

Q. All right. Now, just before you move on, I want to be clear, Mr. Snelson, that none of these figures reflect the results of any rebalancing exercise the results of which have been promised to this Board, I keep saying in Christmas wrapping, but there has been no attempt -- this is simply putting in the specific changes that have been spoken to in a mathematical way?

A. That is correct, and there may be other changes implemented through the rebalancing process.

Q. All right. Now --

THE CHAIRMAN: Now, just to finish off, the 1,000 extra megawatts.

MR. SNELSON: Yes?

THE CHAIRMAN: What is the basis for that? That is an increase, there was 1593 megawatts in the 1990 NUG plan; am I right?

MR. SNELSON: That is correct.

THE CHAIRMAN: And it has now been

increased to 2593 with the added thousand.

MR. SNELSON: Yes.

THE CHAIRMAN: Are you going to come to what is the basis of adding the extra thousand?

MR. B. CAMPBELL: Yes.

MR. SNELSON: Yes, we are.

THE CHAIRMAN: Okay. All right.

MR. B. CAMPBELL: Q. Now, Mr. Snelson, if the load follows this median growth path - that is, the primary load follows the median load growth path - how does the surplus that is shown on page 9 by the end of the year 2000 affect the longer term demand supply balance?

MR. SNELSON: A. Well, the surplus is something that exists for a few years either side of the year 2000. It doesn't indicate a long-term surplus. That is shown on the next slide which is page 10 of Exhibit 320.

This includes all of the resources that were indicated on the two previous tables, but instead of just showing the year 2000, it now shows it over a twenty five year period.

The way you read this figure is that the top line, the top solid heavy line, is the basic load forecast. The solid line below that is the firm load

forecast taking into account all of the demand reductions.

The lower thinner line is the load meeting capability of the existing system. And the higher thinner line is the load meeting capability of the existing system plus the increases in supply from non-utility generation, hydraulic and Manitoba purchase.

And so, the surplus or shortfall can be seen by comparing the lower heavy line with the upper, thinner line. And one can see that the years '96, '97 and '98 are close to balance and it was needs in this period that was one factor in deciding that planning for extra NUGS was a good idea. And that the NUGS that come into service partly to meet that need are also there and contribute to the surplus around the year 2000.

And the surplus has substantially gone by about 2004, which shows that major supply and considerable amounts of major supply are still required in the long term.

Q. Now, again --

THE CHAIRMAN: Well, on this graph, unless I am misreading it, it is more like 2006, isn't it, or 7?

MR. SNELSON: I think it is -- 2005, I think, perhaps the cross-over, is it?

THE CHAIRMAN: Well, I guess eyeballing it, it looks like more like -- it is over 2004 anyway?

MR. SNELSON: Yes. Well, in 2004 it is reduced to a fairly small value. We plan on a margin of the order of plus or minus 400 or 500 megawatts.

MR. B. CAMPBELL: Q. Now, again, Mr. Snelson, is it fair to say that this chart does not represent any -- to be read as representing any overall result of the reintegration exercise the results of which have been spoken of by myself and others so often?

MR. SNELSON: A. That is correct.

Q. Now, can you just summarize then the demand/supply balance considerations with respect to the NUG plan?

A. The first point is that the 3100 megawatts which was announced by the Chair of Ontario Hydro was not constrained by the load and capacity balance picture with respect to the preferred NUG technologies. It is the forecast of what we can get from the preferred NUG technologies.

And this overcapacity situation for a number of years was considered to be acceptable at this

point in planning from a load and capacity point of view based on the strategies of being prepared to meet upper load growth, the uncertainty in the timing of other resources, and there are resources that contribute to that apparent surplus which have some uncertainty associated with them, particularly with their timing, and recognizing that the additional non-utility generation is from preferred technologies.

The plans for major supply NUGS, just like plans for Ontario Hydro generation in Ontario Hydro major supply, must take into account that we are now forecasting sufficient capacity for the 1990s.

Q. All right. Turning then to questions of operational flexibility, how does the need for operational flexibility affect non-utility generators?

A. In planning, we try to maintain a mix of options that can follow the varying load and do so at low cost in an environmentally acceptable way.

Operations has the job of actually managing this on a daily, hourly, minute-by-minute basis.

Mr. Barrie on Panel 2, you will recall, described some parts of this process and I believe you saw some parts of this process on your visit to the control centre.

[2:53 p.m.]

A large part of this day-to-day, minute-by-minute operation is with regards to dispatching of generation, and we provided some information on the dispatching of generation in Interrogatory 3.14.67.

Briefly summarizing some of the things that are in there, --

Q. Perhaps we could just assign the number for that first.

THE REGISTRAR: 321.4.

---EXHIBIT NO. 321.4: Interrogatory 3.14.67.

MR. SNELSON: Dispatching of generation takes place over a variety of time scales which vary from instantaneous through the operation of automatic equipment to the setting of planned outages several months in advance.

Some aspects of dispatching are mandatory for safety, system security or other reasons. Environmental considerations can affect the need to reduce the output of some generation and increase the output of other generation. Another important aspect of dispatching is to reduce the costs by making preferential use of low cost fuels.

Non-utility generation should contribute

its share to the need for flexible system operation that is appropriate for the technology that is being used.

To this time dispatchability for non-utility generation, dispatchability requirements, have been limited to needs for public and worker safety, system security and reliability, with some minimal economic dispatch to avoid periods of surplus base load generation, and this was appropriate while the NUG industry was developing and while NUGs were a small proportion of the total system.

We consider that this approach will remain appropriate for the preferred options that are in the NUG plan. For major supply NUGs we consider that dispatchability similar to Ontario Hydro's generation using comparable technology will be required.

THE CHAIRMAN: That last again, what was it? For the major supply NUGs? You said something.

MR. SNELSON: That they should have dispatchability capabilities similar to the dispatchability that we would specify for Ontario Hydro generation using the same technology.

THE CHAIRMAN: Are there three kinds of NUGs: one, preferred NUGs; two, non-preferred NUGs,

which aren't major supply NUGs; and three, major supply NUGs?

MR. SNELSON: I think we principally have it divided two ways: preferred NUGs, --

THE CHAIRMAN: What about a NUG that isn't a major supply NUG that isn't a preferred? Is it out of consideration? Is it out of the plan? I just want to be clear about it.

MR. B. CAMPBELL: There is nothing that is out of the plan. It is just how they are being treated in the planning, Mr. Chairman.

I am not sure...

MR. VYROSTKO: I can't actually think of the non-preferred, non-major supply NUG. I can't think of an example right now, although that's not to say some may show up, but I think right now the two categories are probably covering off virtually everyone.

THE CHAIRMAN: Okay. Thank you.

MR. CAMPBELL: Q. Do you want to continue then, Mr. Snelson? Those were all of the points that you wanted to make there, as I understand it; is that correct?

MR. SNELSON: A. Yes, that is correct.

Q. All right. If I could have a moment,

Mr. Chairman?

Thank you, Mr. Chairman.

Mr. Vyrostko, I was going to go next to Mr. Brown, but I am going to ask you -- let's just deal with one simple question here before we proceed into this because I think it will help.

Can you explain just briefly, please - and Mr. Brown will be dealing with all of the numbers in more detail - but can you explain just briefly, please, about where this extra 1,000 megawatts has come from? Just simply with that question.

MR. VYROSTKO: A. In essence, over the last year, dealing with it earlier in direct evidence we said that the gas prices have come down, and as a result of the very low gas prices to date in essence these 1,000 megawatts of projects were projects that were not anticipated in the 1990 NUG plan. In fact, they were projects that were able to become economic as a result of the conditions existing today in the industry.

And so, in essence, what we are looking at - and Mr. Brown will talk about it in detail - is that this proposed 1991 plan is no different than the 1990 plan except for the incorporation of this unexpected 1,000 megawatts.

Q. As I understand it, it is this unexpected 1,000 megawatts that is what was described in Mr. Eliesen's speech as being very close to being committed right now?

A. That's correct. Price offers have been accepted, and in at least half of the projects our corporation has also accepted the offer.

Q. And it is fair to say that the corporation simply did not expect to be in this position with respect to that 1,000 megawatts as of a year ago?

A. That's correct, and I think Mr. Brown will deal with some of that as well.

Q. All right. Now, Mr. Brown, in looking to the future, when you publish your NUG plan -- I know you have a particular view of it, and I would like you to explain what the NUG plan represents in Ontario Hydro's planning.

MR. BROWN: A. Basically the NUG plan is a forecast.

There are two activities that we do in the forecast. We estimate the technical potential of non-utility generation in Ontario, and then we forecast the amount of attainable non-utility generation from that.

To date, two NUG plans have been developed: the 1989 NUG plan, which is filed as Exhibit 26, and the 1990 NUG plan, filed as Exhibit 83, a correction later filed in Exhibit 143.

In general, in Ontario, as Mr. Vyrostko mentioned this morning, there are about 1,200 megawatts of what we refer to as historical load displacement generation. These generators have been in operation for many years. The numbers in the NUG plan are over and above this 1,200.

Simply stated, the total number of NUGs in Ontario is 1,200 megawatts plus the NUG plan.

THE CHAIRMAN: Where does the natural NUG fit into that?

MR. BROWN: The natural is part of the NUG plan. It's a growth in historical load displacement that we would have predicted would have occurred without Ontario Hydro's programs and activities.

THE CHAIRMAN: I understand that, but it's not included on page 8, though; it has been netted out?

MR. BROWN: It is, but it's not explicitly stated.

If we turn back to that table in Exhibit

320, page 8, in the basic load forecast it's in the top box of that page. That's where the natural load displacement is accounted for.

So it is buried, is a correct way of putting it, in the 32,800 number.

THE CHAIRMAN: The natural NUGs are in there?

MR. BROWN: Yes. And that number for the year 2000 is 207 megawatts.

THE CHAIRMAN: But, as I understand it, it doesn't play a part, or does it play a part, in your NUG plan, those 207 megawatts?

MR. BROWN: Yes, it does play a part. It is part of the 3,100.

THE CHAIRMAN: It is part of the 3,100?

MR. BROWN: Yes.

THE CHAIRMAN: Okay. All right.

MR. BROWN: The NUG plan is our best estimate of power and energy attainable for NUGs over the next twenty five years.

I will focus on the capacity values of future NUGs, but I think it is important to also emphasize that the energy contribution for NUGs is also important. These numbers are provided in the NUG plan and I will provide the assumptions used to determine

those numbers.

Furthermore, the NUG plan provides the load displacement NUG which is used for load forecasts. The natural NUG is included in the basic forecast, as I just outlined, and a program-driven load displacement is included in the primary load forecast. The purchased NUG is used in the capacity planning.

All these numbers are in the NUG plan. All of them are included in the 3,100 by the year 2000.

The NUG plan includes technologies likely to be developed by the private sector and is connected to the main grid. The NUG plan does not include NUG development in remote communities or small development applications not connected to the main grid, such as the supply to an isolated cottage.

Although we have such projects and we will continue to support their development, they are not part of the plan.

How supported? What do we have? Why not in the plan?

MR. CAMPBELL: Q. In the sense that they are not part of the forecast that you use in doing this demand/supply balance for the bulk electricity system?

MR. BROWN: A. That's correct.

Q. All right. Now, could you summarize the technologies currently considered in the NUG plan?

A. Numbers --

Q. Here I am talking the 1990 NUG plan, okay?

A. There are a number of technologies that were included in the 1990 NUG plan.

It included hydraulic sites. These are typically less than 5 megawatts, but there are sites larger than this. There is other thermal technology, which is a catch-all, which includes municipal solid waste, turbo expanders, wood waste, major supply NUG.

We have another category called "cogeneration", which is the most significant part of the plan and represents about 70 per cent of the forecast. We also considered alternate technologies such as wind and solar.

I want to add that alternate technologies although considered in the 1990 NUG plan were not included in the 1990 forecast. This was because they were not expected to be economic in Ontario, and by that I mean the contribution of these technologies, the wind and solar, were expected to be minimal over the planning period when we did the 1990 NUG plan of less than 5 megawatts over that twenty five year period.

The economics and environmental considerations of these alternate technologies will be discussed further in Panel No. 8.

MR. B. CAMPBELL: Again, Mr. Chairman, this is a case where in terms of the NUG programs in these areas it is all material for this panel, except some of the specifics of the economics and technologies will be dealt with in Panel 8 and I expect that there will be back from printing a document that will be distributed to all the parties fairly shortly.

I have spoken at some of the earlier meetings with parties about this. This document represents -- I think it started out, as I mentioned before, as sort of a briefing note in this area, but it has turned into a very snappy briefing note indeed, and we thought it would be useful to distribute it to all the parties.

That will be out shortly and will be witnessed in Panel 8.

Before I ask Mr. Brown to go on in this area, though, I want to go back, Mr. Brown.

Q. You spoke of a number of technologies in the plan and you mentioned major supply NUG. We seem to be causing some confusion with this term. I am going to try and keep it straight as we go along.

My understanding is that if you look in the 1990 NUG plan you won't find any heading called "Major Supply NUG"; am I correct?

MR. BROWN: A. That's correct.

Q. But you did look at the technology that is involved; that is, gas-fired, electricity only, production, non-utility generation in a combined cycle format?

A. That's the long version of major supply NUG.

Q. All right. Having looked at it, the amount that you included in the plan in 1990 was zero because it was not believed to be economic?

A. That's correct.

THE CHAIRMAN: What was zero, what was zero?

MR. BROWN: In the 1990 NUG plan it was called "fossil fuel generation", which has now been labeled "major supply NUG", and in the 1990 NUG plan our estimate was zero.

THE CHAIRMAN: So it is just a transposition in terms? Is that all it is? It is nothing more than that?

MR. BROWN: In the 1990 NUG plan when we said "fossil fuel generation" we were explicitly talking about electricity only, non-cogeneration.

There is an element in our 1,000 number that is not pure, just electricity only generation,

which I will deal with later in my direct.

THE CHAIRMAN: But let me just make sure I understand. What you called in the 1990 plan "fossil..." What was it again?

MR. BROWN: Fossil fueled.

THE CHAIRMAN: Fossil fueled...?

MR. BROWN: Generation.

THE CHAIRMAN: Generation. Now is called "major supply NUGs"; is that right?

MR. BROWN: Yes.

THE CHAIRMAN: It's as simple as that?

MR. BROWN: Yes.

THE CHAIRMAN: All right.

MR. CAMPBELL: Q. We will be coming to its treatment now as you prepare the 1991 plan or forecast, and we will deal with that in a moment, but I want to come back and go through, when you are preparing this forecast or plan, ask you to describe the sources of information that you use in that development.

MR. BROWN: A. In developing the NUG plan we use four principal sources.

1 The first one is resource assessment. This is generally a list of sites in Ontario that have technical potential.

Our second source is an economic (2) analysis. This is an analysis of larger industrial sites that have cogeneration potential.

The third source is project development (3) information. It is information obtained from NUG proponents through the negotiation process.

The fourth source is project performance (4) information which is information obtained from in-service NUG projects.

Q. All right. Now, I would like to take you through each one of them and start by explaining what you are speaking of when you speak of a "resource assessment".

A. A resource assessment is a process to evaluate the technical potential. The end result of this process is a list of all sites with technical potential. For example, the resource assessment for industrial cogeneration is based on a collection of data where steam is used. In some cases, such as wood waste, there is no site-by-site breakdown available. In this particular case we use provincial totals.

Some of these potentials are lowered to incorporate areas that are impractical, such as for collectibility reasons.

Our resource assessments are based on

internal and external studies. These have been referenced in the plan and are provided in several interrogatories, such as 5.9.18.

MR. B. CAMPBELL: Perhaps we can have that given the next number, which would be...?

THE REGISTRAR: 321.5.

MR. B. CAMPBELL: 321.5. Thank you.

---EXHIBIT NO. 321.5: Interrogatory No. 321.5.

MR. BROWN: As a final check on our resource assessment we compare our technical potentials with those compared by other jurisdictions through business contacts, conferences and trade publications.

MR. CAMPBELL: Q. Now, the second source of information you identified is economic analysis. What are you speaking of when you speak of that bit of information?

MR. BROWN: A. An economic analysis is a study of a typical NUG facility. It determines, based on judgment, the economic viability of the facility.

For cogeneration this is performed using a Lotus spreadsheet program we developed. It uses among other things NUG purchase rates and natural gas prices. This spreadsheet was provided in interrogatories such as 5.14.233.

MR. B. CAMPBELL: And perhaps we could

get the next number for that. That's 321.6?

THE REGISTRAR: Right.

---EXHIBIT NO. 321.6: Interrogatory No. 5.14.233.

MR. B. CAMPBELL: Q. Are there some areas where you have and don't have the necessary data to conduct that kind of analysis?

MR. BROWN: A. At this time it is only the area of industrial cogeneration where we have the necessary data that we can do an economic analysis, and we have referred to this as our cogeneration model.

Q. All right. Now, the third information source you have mentioned, which was project development information, can you give a description of what that body of information covers?

A. Project development information is a data base of information collected from NUG proponents through various stages of the negotiation process.

This information source provides very detailed information such as a listing of all known projects, the location, size, type of each project, connection information, the status of each project, rate and financial assistance information, contract negotiation status and likely in-service date.

Much of this information is provided by NUG proponents in confidence, but we aggregate this

information to determine the timing and location of future NUGs, the amount of NUG that will be load displacement and the amount that will be purchase, the attainable potential for certain technologies where a full economic analysis is not possible. It is also used in the short-term portion of the forecast.

The aggregated and forecast information is set out in the NUG plan and is shared with external agencies such as the Independent Power Producer Society of Ontario and the Non-Utility Generation Advisory Council on a regular basis.

Q. What is the fourth information source you spoke of, which is project performance information?

A. The final information source, project performance information, is a collection of data on actual NUG performance. It includes in-service megawatt capacity, capacity factor information, and other reliability data on in-service NUGs. At the present time, there is limited information available but enough to establish preliminary estimates in this area.

As we collect data over time these preliminary estimates will be improved. Recognizing the importance of this data we are currently developing a new data base which will provide valuable performance

information in the future.

As in the case of project development information, this information is obtained from NUG proponents in confidence.

Q. Now, how do you apply these sources of information in your development of the NUG forecast or "the NUG plan", as you referred to it?

A. The application of these four sources is really dependent on how much we know about each technology, but, in general, the forecast is developed by reviewing the results of the first three sources - resource assessment, economic analysis and project development information - and later we use the project performance information to develop certain forecast assumptions to calculate energy, such as using capacity factors.

[3:17 p.m.]

Q. All right. Now, before we get into the details of the NUG plan, how has that plan or forecast evolved over the last three years, and I would perhaps ask you to just start briefly with the first NUG plan which was 1989?

A. When we developed the 1989 NUG plan, very little forecast information was available. Very few utilities were forecasting long-term NUG

projections and this continues to be the case.

However, recognizing the importance of project development data, our efforts were directed at improving the quality of this data. More projects and more data on each project was included in our data base.

Furthermore, we updated our resource an assessments through literature searches and contacts with other utilities.

Based on the information we had, our forecast of cogeneration, hydraulic and energy from waste or other thermal, as it is called now, the 1989 forecast by the year 2000 was 1,661 megawatts. And by the year 2014, the forecast was 2,663 megawatts. This is the forecast that was used in the Demand/Supply Plan.

Q. All right. Then what steps did you take to improve the 1990 forecast?

A. When we started the 1990 plan, we contracted an outside consultant to assess the 1989 NUG plan and recommend areas for improvement. The report on the findings of the consultant's report was attached to Interrogatory 5.9.54.

Q. Perhaps we could have the next number for that.

THE REGISTRAR: 321.7.

MR. B. CAMPBELL: Thank you.

---<u>EXHIBIT NO. 321.7</u>: Interrogatory No. 5.9.54.

MR. B. CAMPBELL: Thank you.

MR. BROWN: And finally, we updated all four sources of information used in developing the plan the latest forecast information.

Based on this information, the 1990 NUG plan showed an increase in the NUG forecast from the 1661 megawatts I mentioned earlier to 2,107 megawatts.

The major reason for this increase was the addition of two technologies. This represented 350 out of the 450 megawatt increase.

MR. B. CAMPBELL: Q. All right. The 450 being the difference between the 1661 and the 2107?

MR. BROWN: A. That's correct.

Q. All right. Now, what were the two technologies that amounted for the first 350 megawatts of that difference?

A. Based on the project development information, there was a trend of two new technologies emerging in the NUG area: One was electrical generation from natural gas compressor stations; and the second was the use of natural gas generation at wood waste generation facilities. I will discuss both

of these when I talk about the plan details.

And the final 100 megawatts of the 450 megawatt increase was due to an increase in industrial cogeneration of 100 megawatts, and this is due to improvements in our economic analysis model.

I just want to finish off the '90 plan by reiterating that the technologies originally in the '89 NUG plan showed very little substantial increase in the 1990 NUG plan.

Q. All right. Now --

THE CHAIRMAN: Do you have a figure for 2015 for the 1990 plan?

MR. BROWN: It is on my next slide.

THE CHAIRMAN: Oh, all right. I mean, that is related to the 2107. That is what I wanted to tie it in with because you gave us the figures for 1989.

MR. BROWN: Actually, I don't total them here -- 3319.

THE CHAIRMAN: 3319?

MR. BROWN: Yes.

MR. B. CAMPBELL: Q. All right. Now, what steps are you undertaking to improve the next NUG plan that I guess would be dated later this year?

MR. BROWN: A. We are currently working

on the 1991 NUG plan. The methodology we used in the 1990 NUG plan continues to be appropriate. Preliminary indications do not show a significant change in the forecast of preferred NUGS.

In the 1991 NUG plan, we are going to take a closer look at alternate technologies. Recent industry activities have indicated some post-2,000 year contribution, but this is not expected to be significant.

Current activity indicates the major supply NUG proposals are viable. This also includes cogeneration project proposals which use a relatively low percentage of their thermal energy for purposes other than electricity production. These are similar to a major supply NUG.

Those that are expected to proceed will be included in the 1991 NUG plan. This accounts for the 1,000 megawatt increase.

In summary, the estimates of preferred technologies --

THE CHAIRMAN: In addition to the gas price, I think; is that right? In addition to the gas price? The gas price going up, I thought you said a moment ago, was the reason for the 1,000 increase.

MR. BROWN: The decrease in the gas price

has made these purchases viable, yes.

THE CHAIRMAN: So, it ties in with this?

MS. PATTERSON: It is the same 1,000 megawatts?

MR. BROWN: Yes.

In summary of the '91 plan, overall the preferred technologies have not increased from the '89 plan. We have added two new technologies, I mentioned earlier, natural gas compressor stations and natural gas with wood waste and these accounted for changes from '89 to '90.

Between '90 and '91 NUG plan, we have the 1,000 megawatts of additional viable major supply NUGS expected to be committed by the end of this year.

However, the 1991 NUG plan will not try to forecast major supply NUG.

As Mr. Snelson mentioned earlier, as the system needs this technology, the NUG division will solicit NUG proposals.

As commitments are made to major supply, they will be incorporated into the NUG plan at that time.

MR. B. CAMPBELL: All right. Mr. Chairman, if we are going to take the afternoon break, I think if we could do it five minutes early, this is a

convenient time for that break. I expect we will finish today.

THE CHAIRMAN: We will adjourn for 15 minutes.

THE REGISTRAR: This hearing will take a 15-minute recess.

---Recess at 3:26 p.m.

---On resuming at 3:47 p.m.

THE REGISTRAR: Please come to order. This hearing is again in session. Be seated, please.

MR. B. CAMPBELL: Thank you, Mr. Chairman. I have been asked to speak to you with respect to the appearance in this panel for cross-examination purposes of the Solar Energy Society.

A perusal of the statements of concern that we have filed will indicate that we never received a statement of concern from SESCI.

I am now advised that, in fact, one was prepared and it is now in the Board staff's hands and they do want to have the opportunity to cross-examine on this panel and ask simply that I speak to that matter and that their position be worked out. They are quite happy to, as I understand it, fall somewhere towards the bottom end of the list as they have in other panels in terms of position. So, I was asked to

communicate that to you.

THE CHAIRMAN: Also, there was a statement made just a few moments ago about alternative energies being in the NUGS and I am not sure whether that may not enhance their interest in the panel.

MR. B. CAMPBELL: Well, the detailed review of technologies and so on, as I say, is a Panel 8 matter. I have just briefly glanced at the statement of concern and I will speak to Mr. Grenville-Wood who is represented --

THE CHAIRMAN: You might point out that part of your presentation which does refer to alternative energy.

MR. B. CAMPBELL: Yes, I will do that. And, of course, in terms of the development issues around that with respect to its development through the mechanism of non-utility generation, that, of course, is a matter for this panel.

THE CHAIRMAN: I gather, Ms. Couban, you want to be promoted higher on the list; is that correct?

Mr. Moran, is it?

MR. MORAN: Thank you, Mr. Chairman. I just wanted to indicate that we have talked to a few of the intervenors who are earlier on the list and they

have indicated they don't have any objection to us going third, fourth or fifth.

We have a bit of a scheduling problem with some other matters and we would like to go earlier rather than later.

THE CHAIRMAN: Well, would you tell me precisely where you would like to go?

MR. MORAN: At this point, we are probably going to follow IPPSO.

THE CHAIRMAN: All right. That is second.

MR. MORAN: That would be second, that is correct.

THE CHAIRMAN: All right. Well, do you think Mr. Grenville-Wood would mind replacing the government at the end of the list?

MR. B. CAMPBELL: My impression was that that would not be a problem.

THE CHAIRMAN: All right. Mr. Grenville-Wood would be pleased to act in the stead of the government. (laughter)

THE CHAIRMAN: All right.

MR. HUNTER: If I might, Mr. Campbell, we actually were hoping to proceed after IPPSO as well, so I will talk to this gentleman and we will try to sort out the schedule.

THE CHAIRMAN: All right. Thank you. You don't know how long you are going to be?

MR. HUNTER: I would presume we will be no longer than two or three hours.

THE CHAIRMAN: All right.

MR. B. CAMPBELL: Q. All right. With those preliminaries out of the way, if, Mr. Brown, I could ask you to turn to page 11, put up the overhead for page 11 of Exhibit 320.

I guess I would like you first just to go through briefly summarizing the figures that were in the 1990 non-utility generation plan.

MR. BROWN: A. I will be addressing the numbers themselves later on. I just want to bring to your attention the process that we are going to follow, and that is for each technology which is listed across the top, hydraulic, which is written 'Hyd' on the slide for convenience, MSW, turbo expander, wood waste, major supply NUG, the cogeneration portion which includes industrial, institutional, commercial and residential and natural gas compressor stations.

For each one of these technologies, I will be looking at the 1990 NUG plan estimate of technical potential, year 2000 attainable, year 2015 attainable and provide preliminary indications of the

1991 NUG plan for these technologies in terms of the year 2000 and the year 2016.

THE CHAIRMAN: 16 or 15?

MR. BROWN: The 1991 NUG plan is a twenty five year forecast, so it will be going one year longer than the '90 plan.

THE CHAIRMAN: So the figure at the bottom left-hand corner should be 16 and not 15?

MR. BROWN: That's correct.

MR. B. CAMPBELL: Q. All right. Now, Mr. Brown, I am going to ask you then to start with the hydraulic column, please, and I guess first ask you to describe what you have included in the -- or just describe generally the potential for that hydraulic resource and then we will proceed from there.

MR. BROWN: A. The hydraulic resources in Ontario are documented in Exhibit No. 82. You referred to page 12 of Exhibit 320, is a summary of the figures from Exhibit 82.

The total resources in Ontario were estimated at 19,900 megawatts. After deducting the in-service capacity, which is either Ontario Hydro or old load displacement NUG, which is almost 7500 megawatts, if we deduct the 3,591 which is in Exhibit 28 of the Ontario Hydro 1989 hydraulic plan, and deduct

northern rivers such as the Winisk and Albany watersheds that amount to over 5,000 megawatts, and remove those megawatts on parkland which are strict NUG development, which total 694, this value was also explained in Exhibit 28.

And finally, we deduct 1,784 as classified as other environmental, technical or economic reasons, and this is explained in Exhibit 28 and will be further dealt with in Panel 6.

By subtracting all of these values off of the total in Ontario, we have a technical potential for non-utility generators in Ontario for hydraulic development of 1,252 megawatts.

Q. All right. That is the number that is, in effect, your starting point and Panel 6 will be speaking to the rationale for eliminating certain of that capacity which is theoretically available; do I have that right?

A. Panel 6 will be addressing the 3,591, the 694 and the 1,784 figures.

THE CHAIRMAN: Well, I haven't looked at it close enough, but where does the recent Moose River developments come into this?

MR. B. CAMPBELL: Well, Mr. Chairman, that is part of the 3,591 megawatts that were in the

1989 hydraulic plan. That capacity is not considered within the amount available to NUGS that Mr. Brown will be speaking to.

THE CHAIRMAN: All right.

MR. BROWN: And this information is provided in the NUG plan in Table A1-8 and was subsequently revised for Interrogatory 5.14.273.

MR. B. CAMPBELL: All right. And the number attaching to that would be 3?

THE REGISTRAR: 321.8.

THE CHAIRMAN: Give me the interrogatory again, please?

MR. BROWN: 5.14.273.

THE CHAIRMAN: Thank you.

---EXHIBIT NO. 321.8: Interrogatory No. 5.14.273

MR. B. CAMPBELL: Q. All right. Now, how do you go about then making a judgment as to what would be developed over the next twenty five years and what was that figure for the 1990 plan?

MR. BROWN: A. From the technical potential of the over 1200 megawatts, we estimate the likelihood of a site going into service based on its current stage of development; the premise being that most of the promising undeveloped sites have been identified.

Furthermore, the more economic a site is, the further along its development will be.

Site success factors based on project experience are used to estimate the year 2000 and the year 2015 contribution to the 1990 NUG plan.

Q. You are using analysis here 2015 and 16 sort of interchangeably. We should read in 2016?

A. For the 1990 NUG plan --

Q. Oh, for 1990, I am sorry. I am going to confuse this even more. I can see this. I will just be quiet.

A. Different factors depending on the status of the site are used. For an unidentified site - that is, we are unaware of any NUG activity of that site - we have a certain success factor. This increases depending on the level of development. For an identified site, it is a higher number where a NUG proponent has identified an opportunity to us; even higher for a proposed site where proposal has been submitted to the NUG division at Ontario Hydro for detailed consideration and finally once it is committed or a contract has been signed.

Project development data is used rather than economic analysis because it was judged to be impractical to perform a pre-feasibility study of the

over 800 sites that consist of the technical potential. These numbers are identified in the 1990 NUG plan.

For the year 2000, we estimated 251 megawatts of hydraulic NUG would be developed. And by the year 2015 for the 1990 NUG plan, 386 megawatts would be developed.

I just wanted to compare our forecast that was done in the 1989 NUG plan with the 1990 NUG plan and compare it as to the actual development to date.

The top line is the 1989 NUG plan shown in green and the lower line is our revised forecast. The 1990 NUG plan shown in the white bar and the red bars are the actual development. You can see from the actual development it was well below our 1989 forecast and it is one of the reasons why we adjusted our site success factors. And this in turn lowered the hydraulic forecast.

And he also noticed that the actual isn't even keeping up with our 1990 NUG plan forecast which would indicate that our next forecast is going to be less than the 1990 plan.

[4:00 p.m.]

Q. All right. Now, you have expressed those in terms of capacity figures. How is the energy

from those facilities determined?

A. The energy is based on using the name plate or capacity values of the hydraulic stations using a capacity factor based on the performance of industry hydraulic facilities over many years. This value is 65 per cent; that is, the average energy from a hydraulic facility over a year is the size of the facility megawatts times the number of hours in a year, 8,760, times 65 per cent.

Q. All right. What do you see as the main reasons that it influenced your thinking in arriving at the figure of about 251 megawatts to be developed by the year 2000?

A. There are three reasons --

THE CHAIRMAN: Well, that figure has now gone down to 170, in fact, if we are looking at the last chart.

MR. BROWN: The 170 is the 1991 preliminary estimate, which I will talk about now if that's appropriate.

MR. B. CAMPBELL: Q. All right. If you could deal with the reasons for the change in those figures.

MR. BROWN: A. The 1990 NUG plan, we saw that many of the proposed hydraulic projects were

becoming inactive, and, as I mentioned earlier, in our forecast process that we have difference between an identified project and a proposed project and since many of the proposed projects are now into identified this results in a decrease in the forecast.

By just changing our project information and using the same success factors that are detailed in the 1990 NUG plan resulted in a year 2000 forecast of 170 megawatts, a decrease of almost 80 megawatts and a year 2016 forecast of 270 megawatts, a decrease by the same 80 megawatts.

THE CHAIRMAN: Excuse me. What's the difference between an identified and a proposed project?

MR. BROWN: We have various classifications, depending on the negotiation status of the project.

An identified project is a NUG proponent has come to Ontario Hydro to discuss the project with us. After discussions and he submits a proposal, as Mr. Vyrostko mentioned this morning, and that proposal is considered for future development, then that's when it becomes proposed.

THE CHAIRMAN: That was in the earlier chart?

MR. BROWN: Yes.

THE CHAIRMAN: All right.

MR. B. CAMPBELL: Q. All right. Now, you have spoken briefly to declining economics being a factor considered there. Were there other factors that were considered?

MR. BROWN: A. Two other factors were considered. First is development risk and hydraulic development.

To develop a hydraulic project there are many technical and environmental studies required. The costs for these are increasing significantly. There is still a risk that a site may not be permitted for future development even after the studies are done. Many developers are not in a financial position to take this risk.

The second reason is increasing development concerns. More interest groups are expressing concerns about water power development, from recreational concerns to landownership. This may be sufficient to deter development.

Q. I wanted to turn next, then, to your other thermal category, and you described it previously as sort of a catch-all. Perhaps you could just describe what you have included in that section.

A. As shown on Exhibit 320, page 11, the other thermal includes municipal solid wastes, which is municipal solid waste incineration and generation of electricity from landfill gas.

It includes turbo expanders at natural gas pressure let-down locations. It includes wood waste fuel generation and also major supply NUG for what is called in the 1990 NUG plan, "fossil fuel generation".

Q. I am going to ask you to go through the first three, then we will talk about cogeneration, and against that background come back and deal with major supply.

So first, if you could outline the technical potential of municipal solid waste incineration and landfill gas in Ontario as it was outlined in the 1990 plan and perhaps how you determined that number?

A. Technical potential for MSW includes both the incineration of MSW and landfill gas. The estimate in the 1990 NUG plan was 240 megawatts. This was determined based on external estimates of the volume of MSW in Ontario and the internal estimates of landfill gas from project development information.

The MSW estimates also take into account

waste reduction efforts in the Greater Toronto area and the collectibility problems of smaller site locations.

Q. All right. Now, taking all of that into account, in the 1990 NUG plan how much of the technical potential did you expect to see develop by the years 2000 and 2015?

A. With the increasing concern of waste disposal we expect that future MSW would be developed twice as fast as it had in the past. Now, bear in mind this was done a year ago.

116 megawatts of MSW incineration and landfill gas was forecasted by the year 2000 as shown on page 11. 176 megawatts was forecasted by the year 2015. The energy from these facilities was calculated using a 75 per cent capacity factor.

Q. Now, what changes will you be incorporating into your '91 forecast or plan with respect to MSW incineration first and then landfill gas?

A. First of all, we are going to split up this category into MSW incineration and landfill gas, and I will address each of those separately.

First of all, MSW incineration. The technical potential for MSW is expected to increase. However, with respect to the forecasts the Government

of Ontario has stated it will no longer approve future MSW incineration projects. Given the lead time required to develop such a facility no increases above the current 12 megawatts is expected until after the year 2000 at the earliest.

While recycling will reduce the amount of MSW available for incineration the degree of reduction is unlikely to eliminate it. An element of MSW will be included in the later years of the plan. The reason we are doing this is because this technology at the present time appears to be acceptable, and it also depends on the success of current recycling programs.

The second area --

Q. Now, when you say the technology appears acceptable, what do you mean by that? I mean, it clearly isn't acceptable at the moment to the Government of Ontario.

A. In other jurisdictions MSW incineration is an accepted technology -- in the United States and in Europe.

Q. All right. Now, then, if you could deal with landfill gas?

A. We will continue to forecast landfill gas in the NUG plan. The technical potential is expected to increase by about 60 to 70 megawatts.

However, the attainable potential is dependent on large, deep sites, landfill sites. We currently expect by the year 2000 that the existing level of 21 megawatts will double to 42 megawatts.

After the year 2000 we need further study to determine how much landfill gas will be developed by the year 2016. But in summary of MSW, we expect about 50 megawatts by the year 2000 and about 120 megawatts by the year 2016, MSW and landfill gas.

Q. Now, going to the next section of your thermal category, first of all would you just explain what a turbo expander is?

A. There are a few occasions in Ontario where pressure needs to be reduced before distribution. Essentially, we have high pressure on one side and low pressure on the other side.

At the present, pressure-reducing valves are used and the wasted energy available is normally exhausted as heat. However, by running the gas through a turbo expander electricity can be produced to reduce the pressure with no heat waste.

Q. I take it this is just the equivalent of running water through a hydraulic turbine except it is natural gas?

A. It's the very same principle.

Q. All right. Now, what did you estimate the technical attainable potentials to be in your 1990 plan?

A. We estimated the technical potential to be about 30 megawatts. However, not all of these sites are economic due to varying pressure conditions at the sites.

Our forecast of attainable by year 2000 was 5 megawatts and increasing to 7 megawatts by the year 2015. The energy from these facilities was developed using the same capacity factors we used for MSW; that is, 75 per cent.

Q. Do you see any change to these figures? I take it, from the graph you don't see any changes to these for 1991?

A. No, I don't.

Q. Now, with respect --

DR. CONNELL: Just a little technical question. How do you cope with the adiabetic cooling, are these pretty chilly places, these turbo expander sites?

MR. BROWN: It is an outside building. In the winter they do require heating for the gas to maintain the pressures. I am not sure of your point. It's just running gas through a turbine. The gas is

going through a pressure reduction valve without this technology.

DR. CONNELL: It must act a bit like a refrigerator, I would think, with a tremendous loss of pressure.

MR. BROWN: The only facility I have seen with this didn't have any special facilities to account for that, so I assume it's not a problem.

MR. B. CAMPBELL: Q. If you could turn then to your next category, wood waste, and could you advise the Board as to what your estimate of technical potential was as stated in the 1990 plan?

MR. BROWN: A. Technical potential for wood waste and natural gas generation in combination is 660 megawatts. This was developed based on the amount of wood waste available in the province.

We estimated 280 megawatts would be available from wood waste, and accounting for the collectibility of this we estimate about 110 megawatts of this 280 would be available for NUG development.

However, recent project development information indicated that NUG proponents were combining natural gas generation with wood waste generation. On average, projects were proposing 5 parts gas to one part wood waste. This resulted in a

technical potential of 660 megawatts using this technology.

Q. So, strictly speaking, then, those megawatts that are shown in that column are not entirely due to the combustion of wood. It's this 5 to 1 ratio of wood to gas that results in these figures?

A. That's right.

Q. What was your estimate of the year 2000 and 2015 achievable potential? Perhaps you could just explain those figures.

A. Our forecast in this category was based on the premise that wood waste in the past has been developing mainly for disposal reasons, and this will continue at the same rate.

Using this rate and projecting to the year 2000 and assuming the new technology of burning natural gas 5 parts gas to 1 part wood waste would result in 300 megawatts by the year 2000 and 435 megawatts by the year 2015.

The wood waste being burned is the same as our 1989 estimate. The increase is a result of natural gas generation being combined with wood waste generation, and, again, the energy is determined using the same capacity factors as MSW; that is, 75 per cent capacity factor.

Q. What changes do you expect for the 1991 plan?

A. You recall what I mentioned earlier, that there is a large portion of gas being burned in these facilities.

This is now called a major supply NUG. The 1991 plan is going back to preferred technologies, which is just wood waste generation. This will definitely decrease the technical potential as it is removing the combined approach. In terms of the forecast, we don't expect a change in the year 2000 estimate. However, in the 1991 NUG plan we are only looking at preferred options. Removing the natural gas component will lower the 2016 forecast.

Q. I want to then just skip over the major supply - we will come back to it - and deal with the cogeneration portion of the chart, industrial, institutional and gas compressor stations, and the first thing I want to do is explain what you mean when you are talking about cogeneration.

A. Cogeneration, as we mentioned earlier this morning, is the simultaneous production of useful heat usually in the form of steam and mechanical or electricity energy. Our activities are focused on promoting high-efficiency cogeneration, and that's

what's included in all of the NUG plans.

I want to turn your attention to Exhibit 320, page 14, and try to explain the concepts of cogeneration and where major supply fits in.

On the top of page 14 is a typical coal or gas generator. Its efficiency is about 35 per cent. There is a lot of waste heat that comes out, usually into atmosphere or into a lake. This is typical of Ontario Hydro stations such as Nanticoke or Lakeview. As you can see, there is quite a significant amount of waste heat involved in this process.

Beneath this figure is a typical combined cycle generator. It is more efficient than a coal generator, going from 35 to 43 per cent, and that is through the use of combustion turbine and a heat recovery steam generator producing electricity, but it still requires a cooling mechanism, either an air condenser or water condenser, as water is shown on this slide still removing waste heat.

These can be developed either by Ontario Hydro, and these are included in Ontario Hydro's major supply plan as a CTU-CC, for "combined cycle", or it can be developed by a non-utility generator and is a good example of a major supply NUG.

Q. I know Dr. Connell will be adding the

numbers right now, and they don't go to 100, and perhaps you could just explain. There is about a missing 5 per cent if you try and add the numbers for each of these two technologies. Perhaps you could just explain how that is accounted for.

A. Not shown on this display just for simplicity. There are losses in terms of the generation and transformer on the electrical side of 5 to 6 per cent, and that is a footnote in the bottom of the slide.

Q. Now, I think then you have a second slide that deals with high-efficiency cogeneration at this point as opposed to simple electricity production.

A. Turn to Exhibit 320, page 15. The top part of that page shows a typical high-efficiency cogenerator. Those that are looked at in the NUG plan, efficiency is around 80 per cent. As you can see, there is no waste heat being lost. All the steam from the production of electricity is then used in a process which accounts for almost all of the heat. Again, this is the preferred NUG option. It is a high-efficiency cogeneration.

However, not all cogeneration is the same, and that is why I prepared the bottom slide which shows a combined cycle technology with a combustion

turbine and a heat recovery steam generator that sends some of its heat for process. Some of it goes into cooling much like the combined cycle major supply NUG I showed on the previous page. The amount of efficiency from this project varies depending on how much is sent to process and how much is sent for cooling into air or water.

When I am talking about cogeneration I am referring to those that are approaching the 80 per cent level. The lower efficiency cogenerator is very much a function of process steam, and many of the projects that we have on the table today are using very little process steam and are essentially very similar to the combined cycle generator on the previous page.

Q. I take it that when you talk about preferred cogeneration what you are focusing on is the top half; that is, your high-efficiency cogeneration?

A. That is correct.

Q. And at some point you are going to have to decide, I assume, exactly where you are going to draw that line between the two types?

A. We know the combined cycle generator is a major supply NUG, and we know the 80 per cent is a preferred NUG, and we are working on a way to determine where the middle ground is.

[4:20 p.m.] Q. And I take it that isn't precisely defined yet?

A. No, it is not.

Q. Just on that point, could you explain the kinds of tests that are applied? For instance, is there a different class 34 treatment of different types of facilities, these two different types of facilities?

A. The federal government uses a heat rate to determine whether a cogenerator is high efficiency or not. They use a number of 7,000 kilowatthours per Btu -- sorry, 7,000 Btus per kilowatthour, my mistake.

Q. And that is the kind of test that you are looking at when you are trying to decide where to draw the line as to what really constitutes the preferred high-efficiency cogenerator?

A. That's correct. And our current preference premium also gives a full 10 per cent adder for those facilities that have a heat rate of less than 6,000 Btus per kilowatthour and I add that the lower the number, the more efficient the cogenerator is.

Q. All right. Now, with that background, again, I would ask you to explain what categories of this type of generation are included in the cogeneration section of the NUG plan.

A. If we go back to Figure 11, it identifies the three areas of cogeneration that are in the NUG plan: the industrial cogeneration sector, No. 1, the institutional, commercial and residential cogeneration sector, No. 2; and the third, the natural gas compressor station's generation.

For the purists in the audience --

THE CHAIRMAN: Just hold it a second. The one headed Institution is also commercial and residential; is that right?

MR. BROWN: It is three sectors.

THE CHAIRMAN: All right.

MR. BROWN: And the compressor station is really not a cogenerator. It is a generation of electricity based on waste heat recovery, but if the efficiency of these stations can parallel, a high-efficiency cogenerator is included in this section for convenience.

MR. B. CAMPBELL: Q. Okay. If you can deal then with the first portion of that which is the industrial cogeneration and perhaps again explain how you arrived at the technical potential in the 1990 NUG plan?

MR. BROWN: A. Our technical potential estimates starts from steam user data. Data was used

to estimate the technical potential of a high-efficiency cogenerator based on combined cycle technology.

The estimated is adjusted to recognize that there are mismatches between steam use and electricity production and there are a few sites not in the original list that are added or deleted from time to time.

The larger sites added to our original potential over 800 megawatts. There were new sites that were not in our original list and these added over 700 megawatts, 750 megawatts, but a portion of this is also larger NUGS, those above the high efficiency level.

The result of these adjustments from our original list provide a potential of 7,882 megawatts.

Q. All right. And from that, how did you determine the attainable potential in the 1990 NUG plan?

A. In the short term, project development data is used; that is, we forecast those projects that are likely to proceed in the next three to five years.

In the long-term, an economic analysis was conducted; an economic analysis based on the

typical cogeneration project was conducted. We tried to identify the characteristics necessary for a steam site to have economic potential.

The higher the ratio of average steam demand over the year to the peak steam demand over the year, the more economic the site is.

Using our cogeneration model I mentioned earlier, an estimate of the long-term potential was determined. This was provided in Interrogatory 5.14.233.

MR. B. CAMPBELL: All right. And the number for that would be?

THE REGISTRAR: 321.9.

MR. B. CAMPBELL: Oh. I am told this one has already been referred to so will already be on the list, so if we can hold that number.

THE REGISTRAR: We will put it back.

MR. B. CAMPBELL: It has already been referred to as 321.6. All right.

Q. Now, you mentioned your cogeneration model.

Can you identify the significant parameters that were used in that analysis?

MR. BROWN: A. The cogeneration model used three significant parameters: First, the NUG

purchase rates; 2, the natural gas costs associated with electricity production; and 3, the capital costs associated with electricity production, and these are updated on an annual basis.

Q. All right. And what NUG purchase rates did you use in the cogeneration model?

A. The NUG plan is developed using the latest planning system incremental values known as the SICs. These vary as a function of many factors, but one of them is in-service date.

So our cogeneration model looks at three typical years over the planning period. And for the 1990 NUG plan, these are the years 1995, the year 2000 and the year 2005.

The rate that is determined for each particular year follows the same methodology used to calculate project-specific rates as discussed earlier by Mr. Vyrostko. The rates and assumptions are shown in Exhibit 320, page 16, shown on this slide.

So we used the July 1990 project appraisal SICs; these were provided in Exhibit 85. The reasons we used project appraisal rather than planning for the 1990 NUG plan was discussed earlier in Panel 3.

A typical cogeneration project of 15 megawatts or greater is normally hooked up to the 115

kV system. As such, it gets a 4 per cent credit to the rate. Furthermore, we assume high-efficiency cogeneration and this qualifies for a 10 per cent premium as Mr. Vyrostko mentioned earlier this morning.

The rates shown for three years are on page 16. I might add, these are all in 1990 dollars, the year the plan was done.

Q. All right. And could you explain the natural gas prices you used?

A. The NUG plan uses the most current Ontario Hydro natural gas forecast. The gas forecast used in the 1990 NUG plan was a September '89 forecast that was incorporated into the thermal cost review. The starting prices are shown on page 16 and are in dollars of the year. These prices in the model escalate at the same escalation rate as the forecast itself.

If we turn to Exhibit 320, page 17, is a comparison of the gas forecast used in the 1989 NUG plan, the one used in the 1990 NUG plan and the most recent gas forecast produced by Ontario Hydro that will be incorporated into the 1991 NUG plan.

Of interest on this slide is first at the beginning in the year 1990, you see the steady decrease in the starting prices of gas which we have been seeing

over the last couple of years, the decreases, which is making the natural gas projects more viable.

And also shown on this slide is the increase from the 1989 NUG plan forecast to the one that was used in the 1990. This change resulted in the estimate of economic potential decreasing from 5,000 megawatts in the 1989 NUG plan to only 1200 megawatts in the 1990 NUG plan. There is little change between the forecast used in the 1990 NUG plan and the 1991 NUG plan.

Q. And what was the estimate of capital cost, the other factor, one of the other major factors used in your cogeneration model?

A. Turning back to page 16, capital costs of $960 per kilowatt in 1990 dollars was used, so approximately $1 million per megawatt. These costs include all the costs required to integrate the cogeneration into the existing steam system, all costs for the electrical connection, including the cost on the Ontario Hydro system which are charged back to the developer, all natural gas connection costs and all other equipment costs.

This estimate is based on information obtained from NUG proponents and general industry information. It is typical of those quoted in public

documents.

Q. All right. Now, using that information you just described, what were the results of your cogeneration model in the 1990 plan and your forecast of industrial cogeneration?

A. The results of our model found that for an industrial site to be economic, it required a 70 per cent steam capacity factor; that is, the ratio of average annual steam demand to maximum steam demand of an economic cogeneration should be over 70 per cent.

They also found that the economics of a typical cogenerator are not sensitive to the in-service date. As such, we expect the cogeneration growth should taper off in the later years as more promising sites are developed leaving less economic opportunities for cogeneration.

Using this 70 per cent factor, we forecast that 1,250 megawatts of industrial cogeneration by the year 2000; 2,105 megawatts by the year 2,015 will be developed. This is generally consistent with those numbers in the 1989 NUG plan which were 1,155 megawatts by year 2000 and 1,905 megawatts by year 2014.

Q. All right. And how did you forecast energy from these facilities?

A. Energy contribution for a high-efficiency cogenerator was based on an 80 per cent capacity factor. This was determined from a 20 per cent unavailability based on 5 per cent for planned outages, which is roughly two weeks per year, 5 per cent for forced outages and a 10 per cent steam process derating.

This was added for cogeneration because it recognizes that a unit is not always at full load all the time. This is typical during the summer when there is no heating load and the unit is backed down.

Q. All right. And again, what changes do you expect in the 1991 NUG plan?

A. The technical potential is currently expected to increase by over 1,000 megawatts. This is due to active proposals from oversized cogenerators, those using a lot of natural gas.

The year 2000 and year 2016 forecasts of attainable potential are currently expected to be 5- to 600 megawatts higher and this is shown as the figure 1800 on page 11. Again, this is due to oversized cogenerators expected to be signed by the end of this year.

Forecasts of other oversized generators will not be included in the 1991 NUG plan and the

remainder of the forecast is expected to be similar to the 1990 NUG plan.

A long-term natural gas forecast, as I have already displayed, and the NUG purchase rates, are expected to be similar to those used in the 1990 NUG plan.

Q. All right. If you could go then to your next category which covers institutional, commercial, residential cogeneration.

A. The technical potential for this sector was based on an external report which estimated over 6,200 megawatts of technical potential. This report was issued in 1987 and was considered to contain the best available information on this sector.

Although there is considerable technical potential in this sector, over 6,200 megawatts, our estimate is 85 megawatts by the year 2000. This is not expected to increase significantly after the year 2000 as the forecast of natural gas price increases will further lower the economics of this sector.

This forecast is consistent with what we know about the experience of this sector in other jurisdictions.

Q. Now, why is it in this case that only a very small portion of the technical potential shows up in your forecast of what will actually develop?

A. If we compare this sector to the industrial sector, you will notice that the capital costs in this area, because there are smaller machines, are typically 10 to 30 per cent higher on a cost per unit of generation (i.e., for dollars per kilowatt) than a larger industrial cogenerator.

Furthermore, the fuel costs for this sector are much higher. The industrial cogenerators can arrange to get their own gas. The industrial, commercial and residential normally obtain gas from the local gas utility at slightly higher prices.

And third, past that utilization, we mentioned earlier in the industrial sector that you require a 70 per cent capacity factor. This sector is typically using cogeneration for heating and this would not be higher than the 70 per cent that we estimated in the industrial sector to be economic.

Q. And that is simply, I take it, because the heat is required only during the heating season?

A. That's correct.

Q. And what is your view as to whether you propose to make an adjustment to this in 1991?

A. We don't expect a change in this particular sector.

Q. All right. Now, natural gas compressor station non-utility generators, what are they?

A. Natural gas compressor stations along major pipelines can be modified to produce electricity efficiently from natural gas.

[4:35 p.m.]

At present, these stations use gas-fired combustion turbines to drive compressors for the purposes of natural gas transportation. The heat from these turbines is normally exhausted to atmosphere.

The recovery of this heat in combination with additional gas turbines used exclusively for gas generation can result in an efficiency that parallels an efficient cogenerator, and this technology can be viable at low natural gas prices.

Q. I'm sorry, can you run that by me again? I thought you indicated the use of that heat for gas generation; I take it you mean electricity generation?

A. Sorry, the use of the waste heat to produce electricity.

Q. And it is that efficiency that -- the overall efficiency can result in quite a highly overall efficient operation?

A. High efficiency or a low heat rate.

Q. All right. Now, again, could you go through what were the technical and attainable potentials for these and how you arrived at them for the 1990 NUG plan?

A. The 1990 estimate of technical potential was based on project development information and was estimated to be between 240 and 300 megawatts.

Again, based on the project development information we estimated 100 megawatts of this would be attainable by the year 2000 and 125 megawatts of this would be attained by the year 2015. The same capacity factors as cogeneration were used to determine the energy contribution; that is, 80 per cent.

Q. All right. And again, could you explain the difference you see for this technology on the chart that you have put up?

A. The technical and attainable potential are currently expected to increase in the 1991 NUG plan. The technical potential is expected to increase by about 400 megawatts and attainable potential by 240 megawatts.

This increase is again because of the element of major supply in these current proposals and they are not reflecting the high efficiency that could

be attained using straight waste heat recovery.

THE CHAIRMAN: I'm sorry, could you explain that again, please, that last part? What did you say?

MR. BROWN: The natural gas compressor stations that we are looking at originally were incorporating a lot of waste heat recovery, and that is being very efficient.

THE CHAIRMAN: That is being what?

MR. BROWN: Very efficient.

THE CHAIRMAN: Yes?

MR. BROWN: The new proposals we are seeing now have a large degree of electricity only generation added onto that, thereby reducing the efficiency of the particular site, and it is essentially the waste heat recovery project with a combined cycle plan side by side.

THE CHAIRMAN: Yes? And...?

MR. BROWN: And the resulting efficiency is a lot less, and the potential, the megawatts attainable from that site are a lot higher.

THE CHAIRMAN: And this is all developed since the 1990 load forecast?

MR. BROWN: Since the 1990 NUG plan, yes.

THE CHAIRMAN: NUG plan, I'm sorry.

MR. BROWN: In the 1990 NUG plan we were getting proposals, and we have one committed at the present at 40 megawatts, and at that time the proposals were between 40 and 50 megawatts. Now the proposals are 150 to 400 megawatts each.

MR. B. CAMPBELL: Q. So there is no difference in the amount of waste heat that is being used; it is just more gas is being used?

MR. BROWN: A. Yes. That gas is primarily used for electricity generation only.

Q. All right. Now, --

THE CHAIRMAN: But doesn't this make it analogous, or does it not, to a major supply NUG?

MR. BROWN: The new proposals now are very similar to a major supply NUG.

THE CHAIRMAN: Which is not included in your plan?

MR. BROWN: That's correct. Where those sites -- we are not forecasting those in the 1991 NUG plan, but as they are committed -- and this is part of our 1,000 forecast. As they are committed, they will be included in the plan.

THE CHAIRMAN: But you are treating this gas compressor differently although they are the same? You are putting them into the plan for commitment?

MR. BROWN: There are a few that have accepted Ontario Hydro's price offer.

THE CHAIRMAN: Yes.

MR. B. CAMPBELL: Q. So, as I understand it, Mr. Brown, as commitments are actually made they will be reflected in the plan, but you are not going to be forecasting that extra component?

MR. BROWN: A. Our forecast will just be the high efficiency at those sites, which is the 40 to 50 megawatts per site.

DR. CONNELL: So if in fact the expanded plans are not approved you still think the plans that are based only on waste heat are still viable? They would likely go ahead, would they?

MR. BROWN: Yes.

MR. B. CAMPBELL: Q. We have got one missing column, then, the major supply NUG. What was the technical and attainable potential for that technology? Although that name was not used in the 1990 plan, what was the technical and attainable potential for that technology?

MR. BROWN: A. The major supply NUG or the fossil fuel generation, as was stated in the 1990 NUG plan, the technical potential in this area is virtually unlimited.

These are very similar to our own supply options. You can build as many as you need. The attainable potential is largely a function of the natural gas prices. 70 per cent of the lifecycle costs of such a facility is fuel.

Our assessment in the 1990 NUG plan indicated that such projects were not economic in Ontario Hydro's forecast of natural gas prices, and, therefore, we included zero megawatts in the 1990 NUG plan.

Q. And again, what changes do you expect in the '91 NUG plan?

A. As I mentioned earlier, gas prices are down by about 20 per cent from last year. Hydro's natural gas forecasts have estimated a 7 per cent increase. This difference is almost 30 per cent. This now makes major supply NUG economic within system need.

We currently expect 350 megawatts will be committed by the end of the year, and this 350 will be included in the 1991 NUG plan and is one part of the 1,000 megawatts we just recently announced.

However, the 1991 NUG plan will not forecast future major supply NUGs. These are like our own options and they will be constrained by system need, not by economic development. We will include

major supply, as I mentioned, when projects are committed.

Q. All right. Now, you have indicated as well, and what is not shown on the chart -- you have indicated that some technology has been added since the 1989 plan was first developed. Are there any additional technologies that you will be including a look at in your preparation of the 1991 plan?

A. The NUG plan forecasts all technologies we estimate to make a contribution over the 25 year planning period of greater than 5 megawatts.

Based on the recent industry developments in the area of alternate technologies I believe these will make a contribution after the year 2000. These technologies include: wind; solar; plantation biomass - that is, electricity from trees; peat; novel waste heat recovery, where "steam generation" from waste heat fluids other than water, such as ammonia are used; and finally, fuel cells, which is a chemical conversion much like a battery that converts oxygen and hydrogen obtained from natural gas into electricity and water.

Assuming substantial cost reductions occur in these technologies, we are expecting about 200

megawatts in this area by the year 2016. This additional 200 megawatts generally offsets the expected reductions in wood waste, municipal solid wastes and small hydro.

As I mentioned earlier, the cost in environmental considerations of the alternate technologies will be discussed in Panel No. 8.

Q. But in terms of the programs that you are considering putting in place and so on to support those efforts, they would be a matter for discussion on this Panel?

A. That's correct.

Q. I am going to ask you, please, to just go to page 19 and summarize how the forecast has...

A. I believe it's page 18.

Q. I am going to go to page 18 first and just ask you to summarize what you see happening for your preliminary 1991 forecast for the year 2000.

A. Page 18 summarizes the past two NUG plans and provides a preliminary indication of what the 1991 plan will look like.

At the bottom are the NUG plan totals: the 1,661 we estimated in 1989; 2,107 in the 1990 forecast; and the estimated 3,100 megawatts in the 1991

NUG plan.

As shown on this slide, we can identify the two additional technologies that were added to the 1990 plan that increased the number, these being gas compressor stations and the use of natural gas wood waste. Again, these accounted for 350 megawatts of the increase.

The preliminary 1991 forecast also identifies an area where a major supply NUG has increased our forecast. I will point to these specifically.

We have the major supply NUG itself, 350 megawatts. There is a component of major supply included in the gas compressor stations in the 340 megawatts in that number, and in the cogeneration number in the industrial sector of 1,800 megawatts there is a component of major supply in there, and these are represented by proposals we have received that are not high efficiency cogenerators.

While there are some ups and downs in the numbers over these three plans they have generally offset each other. In accounting for the two new technologies and the addition of this major supply addition the forecasts have been fairly consistent.

Q. Can you go through the forecast

towards the end of the plan period then, which I believe is set out at page 19?

A. Page 19 provides the 25 year forecasts, and bear in mind that each one of these ends on a different year.

The '89 plan ends in the year 2014; the 1990 plan ends in the year 2015; and the 1991 NUG plan will end in the year 2016.

The 25 year forecasts are provided. There is a 1989 NUG plan of 2,663; 3,319 in the 1990 NUG plan; and we haven't added up the 1991 yet because there are still a few areas in the areas of municipal solid waste, wood waste and finally alternate energy that need further refinements.

But for the initial demand/supply balance mentioned by Mr. Snelson, we have added 1,000 megawatts as a preliminary indication of the 1991 value on top of the 1990 NUG plan for the same years.

The number is approximately 4,300 megawatts by the year 2014.

Q. Now, finishing then with you, Mr. Vyrostko, --

THE CHAIRMAN: Just a minute. Where is that 1,000? I am at page 19. Show me where that 1,000 is.

MR. BROWN: The 1,000 is included in the 350.

THE CHAIRMAN: I am looking at page 19. Is that the right page to look at?

MR. BROWN: Yes.

THE CHAIRMAN: Where is the 1,000 you are talking about?

MR. BROWN: If we turn to the preliminary '91 forecast and go down to "Major Supply" you will see 350 megawatts?

THE CHAIRMAN: Yes.

MR. BROWN: If you move up to "Gas Compressor Stations" the number is 365?

THE CHAIRMAN: Right.

MR. BROWN: There is a component of that which is part of the 1,000.

THE CHAIRMAN: Well, how much of that is part of the 1,000?

MR. BROWN: A total of 650 megawatts is coming out of that portion plus the industrial portion. I don't have the split here.

THE CHAIRMAN: How much is coming out of those two?

MR. BROWN: 650.

THE CHAIRMAN: 650. That makes the

1,000. Is that right?

MR. BROWN: Yes.

THE CHAIRMAN: All right.

MR. B. CAMPBELL: Q. Now, Mr. Vyrostko, you of course are familiar with these figures and you have heard Mr. Brown's evidence. Are you satisfied that the figures, the preliminary 1991 figures, are reasonable figures to use for planning purposes?

MR. VYROSTKO: A. Yes, I believe they are reasonable, and I believe they are for a number of reasons. One is that I think the industry has matured in its development of non-utility generation and it has demonstrated its capability to respond to our requests for maximum economic non-utility generation.

Secondly, as Mr. Snelson pointed out, we currently have limited capability to absorb non-utility generation, and because of our transmission situation locating NUGs has to be very site specific. Therefore, we will have to focus our attention on the effect of integration of non-utility generation based on system need.

Third, as Mr. Brown discussed, given the characteristics of major supply NUGs being similar to Hydro's major supply options in areas such as size, technology and environmental effects, we believe that

it is appropriate to treat them as a major supply and discuss them in Panel 8 and Panel 10.

[4:50 p.m.]

In addition, with the system need and transmission facilities reaching full capacity, we must focus on the preferred NUGS; that is, that generation using renewable resources and high-efficiency cogeneration.

We have to prioritize any spare capacity we have within our system to those for the preferred NUGS such that the benefits of the province are maximized as much as we can.

And then finally, as we have said before, this NUG plan is a forecast and we will continue to review our NUG forecast on an annual basis and we will incorporate any changes resulting from new project developments and/or industry trends.

MR. B. CAMPBELL: Thank you, Mr. Chairman, those are my questions of this panel.

I would again point out that with respect to this matter of major supply NUGS in terms of the kinds of initiatives that might be taken by the corporation in terms of actually obtaining major supply facilities from the non-utility generation industry, those kinds of questions are entirely appropriate for

this panel.

But given the similarities in technologies and the review of fossil options that is taking place in Panel 8, the detailed technical and environmental and so on effects associated with that type of facility will be covered in Panel 8 as was pointed out in the witness statement.

THE CHAIRMAN: Mr. Starkman and, I guess, Mr. Greenspoon both had concerns about this panel. It is now nearly five to 5:00. I wonder if it wouldn't be better to digest, if you are going to be here tomorrow -- are you going to be here tomorrow, Mr. Greenspoon?

MR. GREENSPOON: Yes, sir.

THE CHAIRMAN: I think it might be better to try and digest some of these things and maybe think about it a bit and maybe we can deal with it tomorrow morning.

Would that be all right, Mr. Starkman?

MR. STARKMAN: That would be fine, Mr. Chairman.

THE CHAIRMAN: And then after that, IPPSO will be ready to start its cross-examination?

MR. MONDROW: Yes, sir.

THE CHAIRMAN: All right. And you will

be at least all tomorrow and probably the next day as well; would that right? Would that be fair?

MR. MONDROW: That is a very safe assumption, yes.

THE CHAIRMAN: Yes. All right. We will adjourn then until tomorrow morning at ten o'clock.

THE REGISTRAR: This hearing will adjourn until ten o'clock tomorrow morning.

---Whereupon the hearing was adjourned at 4:54 p.m., to be reconvened on Wednesday, the 2nd day of October, 1991, at 10:00 a.m.

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